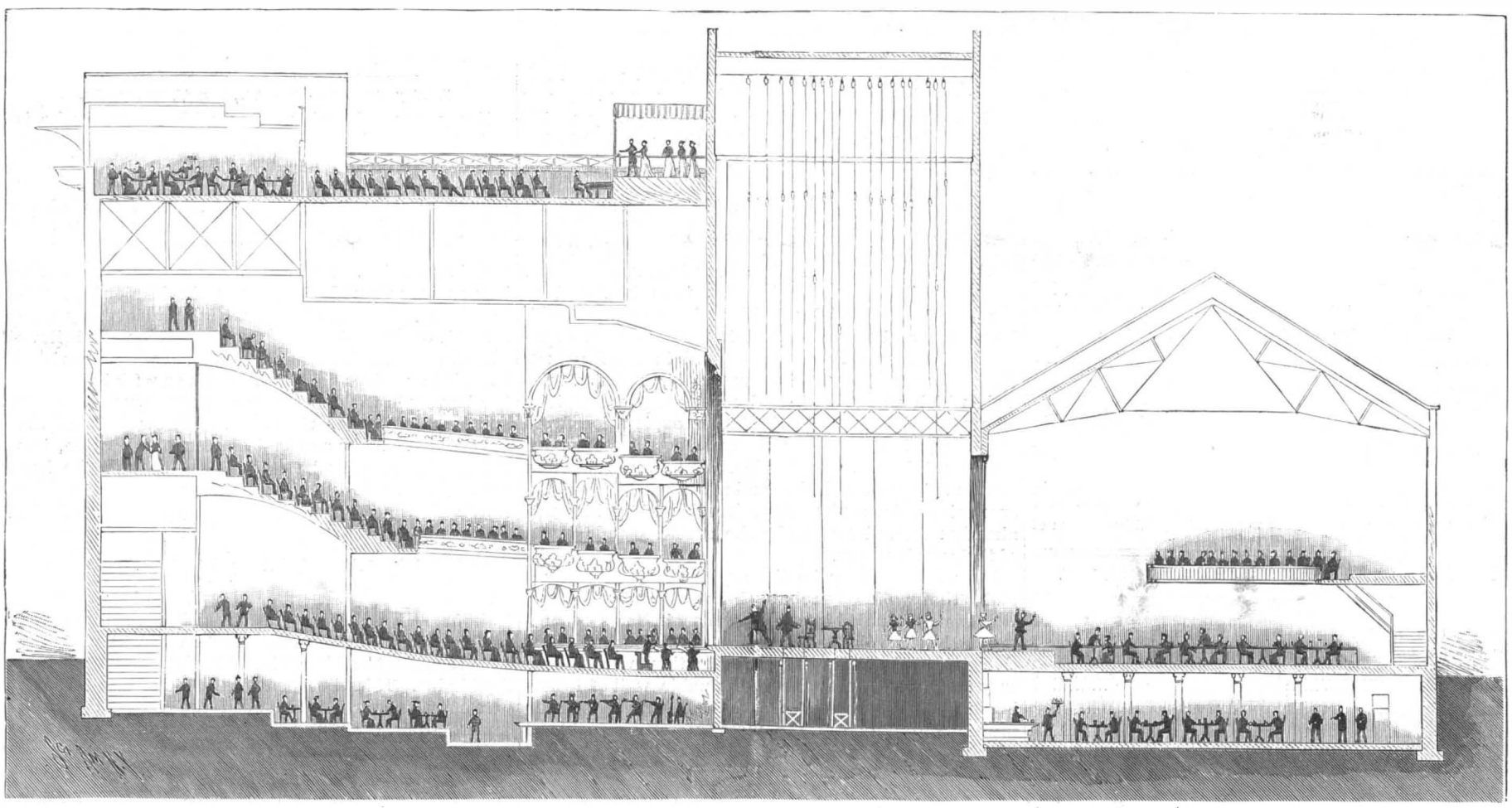
# SCIENTIFIC AMERICAN

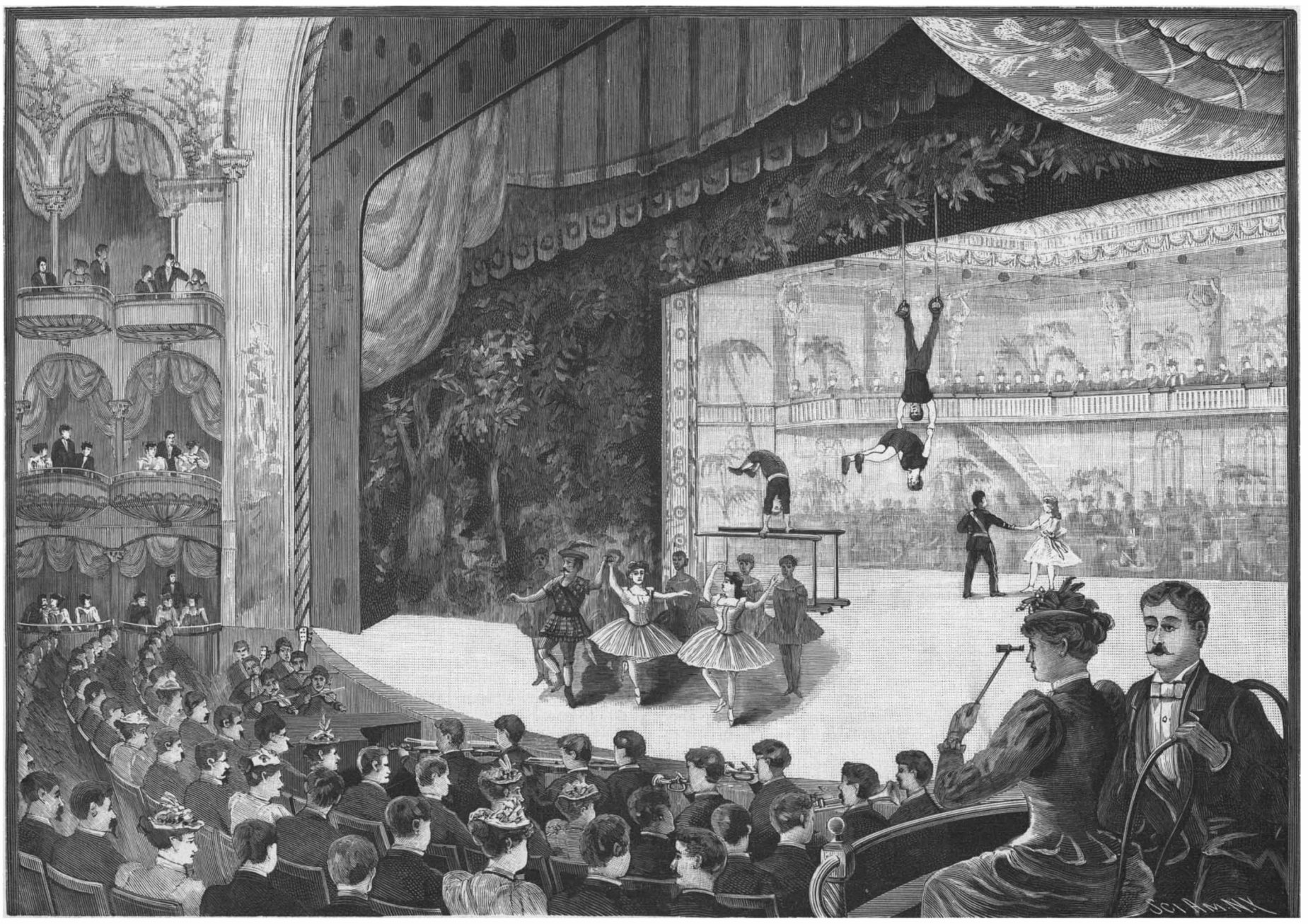
[Entered at the Post Office of New York, N. Y. as Second Class matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXVI.—No. 4. ESTABLISHED 1845. NEW YORK, JANUARY 23, 1897. $3.00 A YEAR. WEEKLY.

SECTIONAL VIEW SHOWING THE STAGE AND THE TWO AUDITORIUMS.



**A THEATER IN NEW YORK CITY WITH TWO AUDITORIUMS.**—[See page 55.]

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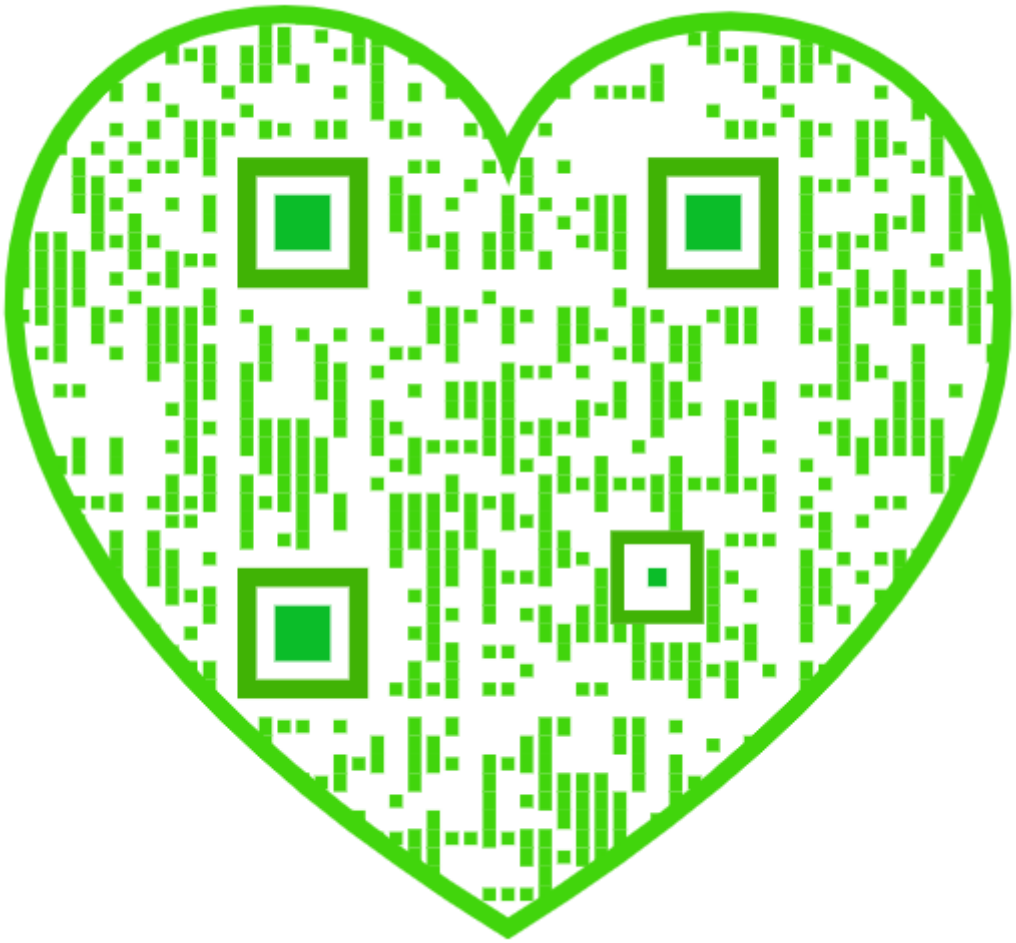

# Scientific American.

ESTABLISHED 1845.

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

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**(Established 1845.)**

One copy, one year, for the U. S., Canada or Mexico.....$3.00
One copy, six months, for the U. S., Canada or Mexico..... 1.50
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00
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MUNN & CO., 361 Broadway, corner Franklin Street, New York.

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MUNN & CO., Publishers, 361 Broadway, New York.

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NEW YORK, SATURDAY, JANUARY 23, 1897.


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### ANTARCTIC EXPLORATION.

There is good reason to believe that the exploration of the Southern Polar regions will in the future be entered upon with something of the zeal which has marked the persistent quest of the North Pole. Unless the present plans miscarry, it is likely that three well found expeditions will shape their course this year for the unknown land and sea that lie within the line of the Antarctic Circle. Of these, one will start from the Old and two from the New World, and all three from the Northern Hemisphere.

Belgium will dispatch an expedition from Antwerp; another is projected in New York by Dr. Frederick N. Cook, of Brooklyn, an Arctic explorer of considerable experience; and the third will probably make ready in Philadelphia, under the auspices of the American Society of Naturalists. All of these are being organized strictly in the interests of geography and general science; and it is safe to say that before many summers and winters have passed the spell of mystery which now broods over the vast regions that are shut in behind the majestic wall of the "Antarctic Barrier" will be broken.

How comes it that through all the long centuries of Arctic exploration, with its lavish expenditure of life and treasure, men have been content to let the secrets of the Southern Polar regions lie so long undisturbed? Perhaps the broadest explanation is to be found in the fact that the activity and intelligence of the world, its wealth and resources, and indeed the bulk of its population, have always been found in the Northern Hemisphere, and interest has naturally centered in the Pole which was nearest and most readily accessible. The particular causes in the earlier explorations were to be found in the effort to discover a northwest passage from the Atlantic to the Pacific, and in later times in a certain spirit of emulation and romance which has led successive Polar explorers to select that field which was already rendered famous by the successes and failures of their predecessors.

But whatever may be the explanation, the fact remains that while we probably know, either by observation or well founded inference, the main facts regarding the North Polar regions, those to the south are relatively as much "terra incognita" as they were a century ago; for whether the interminable wall of towering ice-cliffs hides a sea or a continent remains to be proved, and is one of the most interesting problems which the projected expeditions will endeavor to solve.

Our present knowledge of Antarctica is extremely limited, and the sum of it is soon told. What we do know seems to indicate that the South Polar regions consist either of a vast ice-covered continent or of a collection of islands cemented together, as it were, and capped with ice. From the earliest records of discovery down to the accounts given by Borchgrevink of the late voyage of the Antarctic, navigators have reported the existence either of high land or lofty walls of ice. A glance at any map of Antarctica will show where this continent of land or ice or both has been touched and named by various voyagers. The line which indicates their actual exploration of the coast line is so fragmentary as to give as much reason to believe that these regions are filled with scattered islands as that they contain an unbroken continent.

Victoria Land, with which are associated the names of Ross, Wilkes and D'Urville, is the most extensive tract. It lies between 110° and 170° east longitude; and it was here that Captain Ross, the most distinguished and successful of all Antarctic explorers, made the longest continuous exploration of the coast or ice line that has ever been attempted. He found it to present a perpendicular wall of ice, two hundred feet high, through which at times the land promontories protruded, and he kept in touch with it for four hundred and fifty miles without noticing a break. The same expedition in 1842 penetrated to the most southerly point ever reached by man, latitude 78° 11′ south, where they found themselves among icebergs of colossal size. If we follow along the Antarctic circle, the next stretch of supposed continent is found between 45° and 65° east longitude, and is known as Kemp Land and Enderby Land. Following the circle to 50° west longitude, it intersects Graham Land, which lies between 50° and 60° west longitude, or to the south of Cape Horn and the Falkland Islands.

Compared with the North Polar regions, those at the South Pole present a much smaller proportion of land to water. The Arctic circle, 8,640 miles long, passes over less than 900 miles of water; whereas present indications show that on the Antarctic circle, the proportions of sea to land are about as five to one.

Beyond the facts which we have broadly stated above, practically nothing is known of the vast Antarctic tract. As one contemplates its unknown solitudes a hundred questions arise in the mind. Is it inhabited, and by what manner of people? of what nature are its flora and fauna, what wonders or wealth of mineralogy can it disclose, and what is the geography of its interior? To all of which there is no answer, nor even such indications as might form the basis of reasonable conjecture. It is true Mr. Borchgrevink observed on Cape Adare rocks composed of fragments of quartz, garnet, and feldspar, which he thinks gives reason to "hope that minerals of economic value may be found in these regions." He also observed certain remarkable scars upon many of the seals in these waters, which he thinks might indicate the existence of an enemy answering to the white polar bear of the north.

Capt. Ross discovered lofty volcanic mountains between latitude 76° and 77° south, though Borchgrevink states that the land in the neighborhood of Cape Adare showed freedom from volcanic action. Observations show the temperature to be uniformly higher than at the opposite pole, and the ice formation is less broken and more massive. Add to these facts the records of soundings taken by various navigators, and we have substantially the sum of our knowledge of Antarctica, a knowledge which is so limited as to render this pre-eminently the "unknown land" among the unexplored regions of the earth.

### Leaky Camera—To Test and Remedy.

Every now and again we meet with some one who is quite nonplussed in trying to account for streaks and fog marks "which only occur now and then." The plates and chemicals are often blamed, but frequently it is the camera which is at fault. Some tiny hole or chink lets in light. Sometimes the evil effect is only appreciable when direct sunlight happens to fall in a certain direction. To test for light leakage, cap the lens, remove ground glass, cover the head with focusing cloth, and turn the camera about in every conceivable direction in strong sunlight. Try the bellows when full out, half out, and so on, and when the rising front is in various positions. Look out for light finding its way in the diaphragm slot or between the front and lens flanges, or through the screw holes of the rising front. Make a second similar investigation, but this time remove the lens and look through the lens hole. Insert a dark slide in its proper place and draw the shutter. You will very probably find that a slight glimmer does find its way along the edge nearest to the draw slide, and this will fully account for the foggy streak along various negatives.

The remedy depends upon the place where the light leaks into the camera. If in the bellows, a tiny patch of black court plaster (inside and out) will probably meet the case, or a bit of black kid glove and a touch of liquid glue. If in the woodwork, a bit of black sealing wax may answer. If between the lens flange and camera front, try plugging with stiff yellow soap, or putty may do. If the diaphragm slot of the lens is at fault, a broad rubber band or one made of black elastic or velvet ribbon will meet that case. If light gets in between the camera back and dark slide, this should be trapped by gluing (not on the top of, but in place of the old) a new piece of soft close pile velvet ribbon. Liquid glue, diluted with vinegar, is a convenient adhesive. Have a care that this is confined to the back of the velvet, otherwise its use is obviously destroyed. —The Amateur Photographer.

### The St. Louis Breaks Her Own and the St. Paul's Record.

It is gratifying to learn that the American line steamship St. Louis on her arrival at Southampton on her last trip completed the fastest trip to the eastward ever made by the ships of this line. The eastward record is held by the Fuerst Bismarck, which at the present writing is in trouble on the other side, being fast aground near her home port. The latter ship has crossed in six days, ten hours and fifty-five minutes, which is one hour and twenty-five minutes faster than the recent trip of the St. Louis, which was made in six days, twelve hours and twenty minutes.

When it is remembered that this was done in the unsettled winter weather, it is an excellent performance, and gives reason to hope that before the year is out both the eastward and westward records will be held by the American line. The westward record for this route was captured last summer by the St. Paul, and now stands at six days and thirty-one minutes.

### To Limit the Height of Tall Buildings.

At the recent annual meeting of the Board of Trade and Transportation in New York, the report of the special committee on the subject of the limitation of the height of buildings recommended that a law be drafted and presented to the Legislature providing that, on the wide streets and avenues of this city, no building hereafter erected shall exceed 200 feet in height, and that no building used as a hotel or apartment house shall exceed 165 feet. These measurements shall be from the curb level to the highest point of the cornice or roof beams of a building. Justly proportionate lesser heights should be provided for the erection of structures on the narrower streets and avenues of the city. This law should also provide that in every building erected to a height of 137 feet and over there shall be two separate stairways leading from the ground floor to the roof, one of which shall be remote from the elevator. It was further recommended that the law shall require that all buildings over 137 feet in height shall have a complete fire fighting plant, this obligation to apply to all such buildings that are already in existence. It was also recommended that the present building laws be revised.

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### The Davy-Faraday Research Laboratory.

In Albemarle Street, London, adjoining the imposing facade of the Royal Institution, is an old fashioned mansion, which was once the residence of Lord Cowley. Like most of these West End residences that antedate Nash and the age of stucco, its lofty rooms and handsome staircase recall the spacious hospitality of bygone days when Albemarle Street was very "West" indeed and fashionable society groped its way home by aid of the linkboy's fitful torch. But it will henceforth subserve the genial purposes of hospitality no more. Peering through the deep Queen Anne windows to-day, you will see without difficulty that in some way or other science has set her seal on it. The walls have lost their somber paneling and gleam with the cleanest of white tiles. You get a glimpse of long, severe teak tables, fitted up with curious metal taps, glass vessels with crooked necks, rows of Bunsen burners, and a miscellaneous population of professional looking stoppered bottles. No. 20 Albemarle Street, in fact, looks like a branch of the Royal Institution next door, only more so. The explanation is that what was Lord Cowley's town house is now an important national institution—the Davy-Faraday Research Laboratory, to wit—founded and endowed by that generous and enthusiastic man of science Dr. Ludwig Mond, F.R.S. It will be practically the first great public laboratory ever established in England purely for the purposes of chemical and physical research. Dr. Mond has lavished money on the alterations, fittings, apparatus and appliances required to convert this roomy old building into a place where the patient and delicate work of scientific exploration may be fitly carried on, and he has crowned all with a splendid endowment to meet its heavy working expenses. The Royal Institution next door is to act as a sort of godfather and guardian to the Davy-Faraday Laboratory, but otherwise it is to remain an entirely independent institution. The keynote of Dr. Mond's public spirited scheme for the advancement of science is simple. The laboratory, with its splendid equipment, is open as a free workshop to every man of science who wishes to enter the field of pure research and can show the trustees that he is the right man for the work.

Externally there are only trivial signs of the splendid accommodation that Dr. Mond has provided inside No. 20 Albemarle Street for the men of research. A London Daily Graphic representative who recently went over the laboratory found that the numerous spacious rooms extending from the basement to the fourth floor had all been admirably utilized. No fewer than sixteen separate laboratories for research work, each capable of accommodating one or more investigators with their assistants, have been provided, besides a large museum of apparatus and various rooms for special experiments. It is interesting to note how the specialisms into which all scientific research tends to divide itself appear to have been provided for. On the ground floor, for instance, is a fine room specially fitted for the delicate work of organic chemistry—that progressive branch which has given us the myriad useful products of coal tar and has the loftiest aims, perhaps, of all. You can see in all the beautiful fittings and apparatus the experience which Dr. Mond has borrowed from the great German laboratories.

At the rear of this is an equally fine room for "inorganic" research, and between the two a balance room, where the subtile compounds under treatment by the chemists are weighed down to the tiniest fraction of a grain. Solidly bedded on masses of stone projecting from the walls, nothing short of an earth wave would give them a tremor. When you are weighing to the 5,000th part of a grain, you require precautions of this sort.

On this same ground floor is a useful little ironclad den. This is the explosion room, and the post of observation is at a small hole in the iron door. Down in the basement are rooms for thermo and pyro-chemistry. The latter means research with the all-conquering electric furnace. Great batteries of electrical accumulators are to be found here, and deep down below the level of Albemarle Street we find Lord Cowley's wine cave converted to the nobler uses of a "constant temperature" vault. A beautiful room is the museum of apparatus on the second floor, where everything will awe and bewilder the layman. For here are stored all the fearful and wonderful tools with which the researchers will work. It is a blaze of glass and brass. By the time the visitor has got up to the third floor he gets bewildered with the apparently endless succession of handsome workrooms, all splendidly fitted with teak operating tables, glazed fume chambers, slate reagent racks, gas furnaces, blowpipe stands, stoneware sinks, and what not. On the fourth floor it is still the same, varied by a dark room for electric discharge observations, and another absolutely black for photographic work. Even the roof comes in; the eternal red gas and blue water pipes which crawl about everywhere are found writhing up here. In a word, this is a place where the chemist can be happy. It is kept at the even standard chemical temperature (62 deg. Fahrenheit) throughout by steam radiators, and there is a lift reaching every floor. Dr. Alexander Scott will be the superintendent of the laboratory, and Lord Rayleigh and Prof. Dewar its directors.

The laboratory was opened by the Prince of Wales on Tuesday, December 22, 1896. Dr. Mond made an appropriate speech in which he gave an idea of the motives which prompted him to make the munificent gift which cost him some $500,000. He then gave a history of the enterprise from the time when he first brought it to the attention of the scientific world. He said that he "named it the Davy-Faraday Research Laboratory in perpetual memory of those two pioneers of science who carried out their world famed and epoch making researches almost on that spot, and whose example he hoped would stimulate and inspire every one who came under that roof. . . . As soon as his royal highness had declared the building open, persons of either sex or any nationality would be welcome within its walls, if they could satisfy the laboratory committee that they were fully qualified to undertake original research in pure and physical chemistry; the preference would naturally be given to those who had already published original work."

The Prince of Wales, in reply, said: "Prof. Mond, it affords me much satisfaction to assist at the opening of the series of beautifully arranged and well equipped research laboratories which this country owes to your generosity, and I congratulate the members of the Royal Institution of Great Britain upon this most important accession to the resources which have been placed at the command of the institution for the advancement of chemical and physical science. The Royal Institution has long enjoyed a world wide reputation, thanks to the marvelous work of the succession of illustrious men whose researches, carried on within these walls, have very largely contributed to secure and maintain for this country a foremost position as a source of great discoveries and important advances in science and its applications. The identification of the laboratories which you have founded with the names of two of the most eminent of former professors of the Royal Institution and of English men of science—Humphry Davy and Michael Faraday—is a graceful act on your part. The fact that the present distinguished professors of physics and chemistry, Lord Rayleigh and Prof. Dewar, have undertaken the important duties of directors of the new research laboratories without any remuneration must afford most gratifying evidence to you of the great faith entertained by them in the benefit to the promotion of science which your wisely applied munificence is destined to realize." His royal highness then declared the laboratory open.

### Favorable Condition of Export Trade.

An excess of exports of $102,882,264 was the gratifying exhibit made by the records of the fiscal year 1895–96, says the New York Times. A recent tabulation for the calendar year, in part official and estimated for the months of November and December, made it plain that the excess of exports would be much greater for the fiscal year 1896–97, if the tendencies shown during the calendar year were not changed. The detailed report of exports and imports for the eleven months of 1896 will soon be published, and they will support the statements published recently in the same paper.

The figures referred to indicated that the imports for the calendar year would be about $687,000,000, while the exports would be $907,000,000. But the detailed statements for the eleven months since made up show that the export trade ran above the average for the preceding months, and that at the close of November the exports were $870,000,000. During November the exports of domestic merchandise were $107,830,878. Unless the exports dropped suddenly in December, and there is no indication in the advance figures of the Treasury that they did fall, it is evident that the total exports for the twelve months will be not far from $970,000,000.

There may have been an increase beyond the average of previous months in the imports, but the figures hardly will go much beyond $700,000,000, if, indeed, they reach that total. So that the prospect is that it will appear that this country has exported, exclusive of gold and silver, $270,000,000 more than it imported. If this ratio continues during the next six months, the result will be the largest balance of trade in the history of the country. According to the Treasury report, our largest balance was in 1879, when the exports exceeded imports $264,661,666.

In view of the warnings that are being thrown out by Canadian and other British interests that they need not expect to receive any concession in the way of low tariffs, or much by way of reciprocity, from the Ways and Means Committee, it is interesting to note the importance of the trade that is to be thus discouraged, while the attractiveness of reciprocity is to be tried upon Central American and West Indian buyers, who have not yet developed wants as many or as imperative as those of the people of the United Kingdom.

Take agricultural implements, for instance. The United Kingdom, Germany, France, and all the rest of Europe took less of these things from this country in the eleven months ending with November than they did in the corresponding months of 1895. British North America, taking $296,159 in eleven months of 1895, took $370,128 in 1896; Cuba fell from $50,954 to $1,306; Argentina dropped about $240,000; other South American countries took less than they did in the previous year. But British Australasia, taking $357,336 in 1895, bought $412,007 in 1896, an increase of $54,671, or twice as much as the value of all the agricultural implements sent to Brazil.

British North America was one of the few countries that took in 1896 more books, maps, engravings and other printed matter than it took in 1895. In the eleven months of 1895 there was sent to British North America $470,240 of these goods; in the eleven months ending November, 1896, $545,035, an increase of $74,798, more than the total export of such goods to Colombia, or Mexico, or Brazil and Argentina combined, all of which countries took less than they did a year ago, while British Australasia added $18,959 to her demands of the previous year.

A table will show at a glance the gains of the year in exports of carriages, freight and passenger cars:

| | Eleven months ending November, 1895. | Eleven months ending November, 1896. | Increase or Decrease. |
|---|---|---|---|
| Carriages and vehicles | $1,454,736 | $1,733,778 | *$299,042 |
| Cars, passenger and freight, for railroads | 867,851 | 782,303 | †65,548 |
| Total | $2,322,587 | $2,516,081 | *$193,494 |
| United Kingdom | 326,888 | 454.495 | *127,607 |
| British North America | 125,010 | 156.461 | *31,451 |
| Mexico | 398,932 | 540,189 | *141.257 |
| Argentina | 63,835 | 105,931 | *42,096 |
| British Australasia | 207,720 | 260,139 | *52,419 |
| Africa | 134,756 | 331,560 | *196,204 |

*Increase. †Decrease.

The trade increase with Africa in carriages and cars was more than the net increase in that of manufactured goods.

The cotton raisers and manufacturers will be interested to see who were our best customers for manufactured cotton and for cotton cloths. The showing is as follows:

| | Eleven months ending November, 1895. | 1896. |
|---|---|---|
| United Kingdom | $80,942,499 | $102,051,748 |
| Germany | 33,212,325 | 38,049,596 |
| France | 17,027,138 | 19,089,884 |
| Other Europe | 23,106,988 | 28,386,284 |
| British North America | 2,787,998 | 2,814,529 |
| Mexico | 1,288,364 | 1,363,986 |
| South America | 4,650 | 1,764 |
| Asia and Oceanica | 771,327 | 1,380,677 |
| Other countries | 823 | 612 |
| Total unmanufactured | $159,142,112 | $193,139,010 |

There was a gain in exports of cotton cloths in the eleven months, as compared with 1895, of $5,764,971, the gains being made almost everywhere except South America. The greatest gain was in China, which bought $5,534,482 of cotton cloths, or $3,758,653 more than in the like period last year. British North America exceeded its take of 1895 by $547,661.

The United Kingdom, British North America and British Australasia were the purchasers of a large part of the total export of $3,408,612 of bicycles and parts of bicycles. They took more than two-thirds of the whole export. Of builders' hardware, the United Kingdom, Germany, France, Central America, Argentina and Brazil were improving customers, British North America, British Australasia, and Mexico showing the most improved demand.

Almost every country with which this country trades took a great deal more of American machinery in the eleven months than they did in 1895—an increase of $7,302,970. The United Kingdom took $2,000,000 of this increase. All through the rest of the list the recurrence of the United Kingdom, British North America, and British Australasia as customers that persist in buying more of the United States is striking, particularly as the evidence is side by side with that showing that the countries with which the United States was at great trouble to make reciprocity arrangements appear to be falling away from this country.

### Large Shipment of Mining Machinery.

We publish in another column an account of the vast increase in our export trade during the past year, and especially the increase in our exportation of manufactured goods and machinery.

On the 6th inst., the two steamers Lady Furness and Kurdistan sailed from New York direct for South African ports—Cape Town, East London, Natal, etc. These steamers belong to the Union Clan, and American and African lines, both English companies, and the lines have been established with regular monthly and semi-monthly sailings for the past three years.

On the steamers above named the Gates Iron Works, of Chicago, shipped thirteen carloads of mining machinery consigned to Johannesburg. The total shipment weighed over half a million pounds.

THE Academy of Natural Sciences, of Philadelphia, has decided to confer the Hayden Memorial Award for 1896 on Prof. Giovanni Capellini, of Bologna, the geologist.

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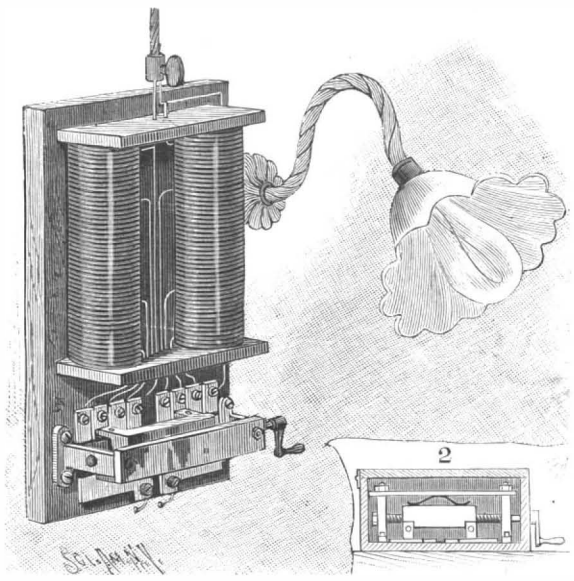
### A NEW ELECTRIC CURRENT REGULATOR.

To regulate the intensity of an electric current, more particularly as used with incandescent electric lamps, the improvement represented in the accompanying illustration has been patented by William Hawker, of Windsor Mills, Quebec, Canada. The regulator is designed to be of especial value in a sick room or hospital, or in other places where it is desired to turn down the light as may be done with a gas jet, without entirely extinguishing it, and it may also be used with many devices, the principle being designed by the inventor for application with either alternating or direct currents. On a suitable base plate is a pair of resistance coils and four pairs of contact plates, as shown in Fig. 1, and shunts extend from the first pair of contact plates to connections with the lower ends of the coils. From the second pair of contact plates the shunts are tapped into the coils at a point perhaps a quarter or a third of the distance up, and from the third pair of contact plates the shunts are connected with the coils at a still higher point, while the last pair are connected with the lead wires, from one of which a shunt leads into the upper end of one resistance coil and from the other a shunt leads to the upper end of the other coil. On the base are two main contact plates with which the lamp wires are connected; and to close the circuit between them and the plates connecting with the resistance coils, a block of insulating material is employed, as shown in Fig. 2, the block being moved by a screw shaft having at its outer end a crank handle, and the block having at its ends metal plates electrically connected by a strip of metal. As will be readily understood, a varying resistance, increasing or diminishing the intensity of the light, is obtained by connecting the several plates to the resistance coils at different points. The improvement is here shown adapted for use in connection with one incandescent lamp, but the regulator may be made of any suitable size for use in connection with a series of lamps or other devices, although the inventor has patented another form of regulator designed to use with a number of lights.




HAWKER'S ELECTRIC CURRENT REGULATOR.

### Celebration of Niagara's Electric Power.

The successful transmission of electric power from Niagara Falls to Buffalo was celebrated January 12 by a banquet at the Ellicott Club, of Buffalo, which was attended by about 400 invited guests. The menu cards were elaborately gotten up, the covers being made of aluminum manufactured at Niagara Falls with the electricity developed there, and with the name of each guest engraved thereon. Among those present were Nikola Tesla, of New York; Elihu Thomson, of Lynn, Mass.; E. J. Houston, of Philadelphia; Charles F. Brush, of Cleveland; Elisha Gray, of Chicago; Charles A. Coffin, of Boston; George Westinghouse, of Pittsburg; John E. Hudson, of Boston; W. J. Johnston, of the Electrical World; D. O. Mills, of New York; Edward A. Adams, president of the Cataract Construction Company; Francis Lynde Stetson, of New York; Charles Lanier, of New York; S. E. Barton, of Chicago; W. H. Lawrence, of Cleveland; Frederick A. Nichols, president of the National Electrical Association; Dr. Louis Duncan, president of the American Institute of Electrical Engineers; C. A. Cutler, of New York; S. Dana Green, of Schenectady; Dr. Coleman Sellers, of Philadelphia; Frank W. Hawley, of Pittsburg; and Joseph Wetzler, of the Electrical Engineer.

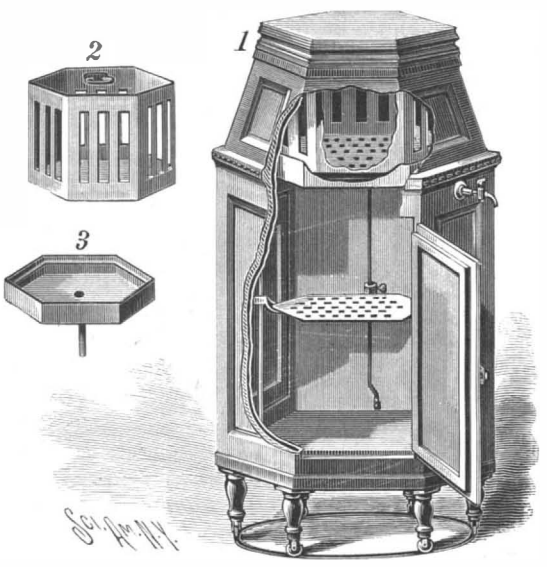
### A Sixth Century Copyright Suit.

In Mr. George Haven Putnam's interesting work, "Books and their Makers during the Middle Ages," he gives what is probably the first contention for copyright in the history of European literature. St. Columba (A. D. 521–597) belongs to the Irish saints, though the greatest part of his life was spent in Scotland. When visiting his master, Finnian, he made a hurried and clandestine copy of the abbot's Psalter. He shut himself up in the church where the book was kept, to carry on his nefarious labors. A nocturnal wanderer, attracted by the light, carried the story to the abbot, and Finnian, indignant at the piracy, claimed the copy from Columba on the ground that the transcript is the offspring of the original work. Columba refused to give up the manuscript and the case was referred to King Diarmid at Tara for adjudication. The opinion of the king was given in a phrase which has since become a proverb in Ireland: "To every cow her calf, and, consequently, to every book her copy." Columba was greatly incensed at the decision and raised a revolt in which the powerful clans of his relatives succeeded in overcoming the king. This manuscript, which was the cause of civil war, was afterward greatly venerated as a kind of national and religious palladium. This Psalter went by the name of Cathoc, or "the fighter." It was preserved in the O'Donnell family for thirteen hundred years. It is believed that the famous "Book of Kells," a copy of the Gospels, was also the work of Columba, the poet monk.

A COMPLETE series of photographs of the late Chinese-Japanese war, taken on the spot, forms a feature of the international photographic exhibition now being held at Berlin, says Wilson's Photographic Magazine. The collection has excited much interest as the most comprehensive photographic record of war yet shown.

### A CONVENIENT HOUSEHOLD REFRIGERATOR.

The illustration represents a refrigerator arranged to turn on a track, in order to afford ready access to its interior, for which purpose it is provided with three doors, on alternate sections of its hexagonal sides. The improvement has been patented by Joseph Bell, of No. 2087 Washington Avenue, New York City. In Fig. 1 the refrigerator is represented with one of its doors open, and a portion of the casing broken away to show the interior, Fig. 2 representing the ice box and Fig. 3 the drip pan, forming a support in which the ice box rests when in position in the refrigerator, the pipe in its bottom leading to the discharge faucet at one side. The body of the refrigerator has an interior lining of metal, at a slight distance away from the inner face of the body, to form an air space. The ice box has slotted openings in its sides to facilitate the free circulation of air, and has handles by which it may be readily removed, the ice being inserted by lifting the cover at the top, and the drip pan, in which the ice box is held, being supported by brackets. Adjacent to the closed sides of the refrigerator body are vertical supporting rods, on which are fitted to slide the projecting arms of shelves, which are secured in place as desired by means of thumbscrews. As will be seen, the interior of the body is readily accessible through either of its doors, the shelves may be conveniently adjusted up and down, and the various parts are readily removable to facilitate the thorough cleaning of the interior.




BELL'S HOUSEHOLD REFRIGERATOR.

IRRIGATION WORK, NAVAHO RESERVATION.

### RECENT IRRIGATION WORK ON THE NAVAHO RESERVATION.

BY COSMOS MINDELEFF.

In its efforts to better the condition of our Indian tribes, the Indian Office has been devoting much attention to their industrial development, and the effects of this policy are already marked and in the highest degree satisfactory. It is now apparent that many of the tribes need only proper instruction and encouragement to develop into prosperous farming communities. The irrigation works and ditches on the Navaho Reservation afford a fair indication of what can be done. In March, 1893, Congress made an appropriation for irrigation ditches and artesian wells and for the increase and preservation of the water supply on that reservation. A superintendent of irrigation and engineer in charge was appointed about a year later—Mr. E. C. Vincent—and active work commenced in July, 1894. At that time there was an available balance of a little more than $50,000.

The Navahos have always been classed as a "wild tribe," and, while they have given us comparatively little trouble since we acquired their country through its conquest from Mexico, in 1846, by Gen. Kearney and the "Army of the West," they are wild by nature. In fact, they have al-

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ways been thieves and robbers, and preyed upon their weaker neighbors. Their wealth, for they are a very wealthy tribe, consists of countless thousands of sheep and goats and innumerable horses; all descended from flocks and herds originally stolen from the Mexican settlements and the Pueblo villages along what is now the eastern border of the reservation and in the valley of the Rio Grande in New Mexico. When the Atlantic and Pacific Railroad was built, some fifteen years ago, many new trading posts were established in and on the borders of the reservation, but the industrial condition of the Navahos was very little changed, except that an outside market was created for their wool and pelts and the pastoral form of life became more fixed. Gradually, however, the white man's luxuries—sugar, coffee, flour, and calico—became more and more necessities.

The men looked after their herds of horses and took very good care of the few cattle which strayed into the reservation or were picked up about its borders; the women attended to their domestic duties, wove blankets for sale to the traders, and raised families of children, by whose aid they cared for their great flocks of sheep, for by long established custom the flocks belong exclusively to the women, and are their especial care. Under such social conditions large communities were impossible. Each man built his little hut within some certain section, which had belonged from time immemorial to his family or clan, and he located it where the pasture was good. But he always had at least two such huts, and moved his family and flocks from one to the other, as the season or special circumstances dictated. Under such conditions agriculture could not thrive, and, in fact, it was practically unknown. A few patches of corn here and there in the sandy beds of intermittent streams and a few melon vines in favorable places measured its extent, while the methods pursued were crude in the extreme.

With the removal of the duty on wool by Congress, a new era opened for the Navahos, and at first much hardship resulted. The wool furnished by their sheep is about the lowest grade which comes to market, and can be used only in carpets and such manufactures, but it meets competitors in the low grade Australian and Russian wools and recently in those from the Argentine Republic. When the duty was removed the value of the wool in the traders' stores fell at once to about one-half the former figure, and a flock of sheep no longer furnished the means of obtaining the articles which had grown to be necessities. As a result the whole tribe, numbering some 12,000 or 14,000 souls, are changing from a tribe of robbers, preying upon their neighbors and afterward subsisting on their spoils, into peaceable farmers living by their own labor.

The Navaho Reservation is practically waste land, and, except in a few places, principally along the northern border, there will never be any trouble from that pregnant cause of Indian wars—the encroachments of the whites. In simple terms, the region consists of a vast elevated plain, sandy and arid in the extreme, crossed diagonally by a range of mountains. The great valleys which constitute the greater part of the reservation are cut and seamed by innumerable little canyons, and are practically without water during most of the year. They are characterized by an almost entire absence of trees, which are replaced by an abundance of sage brush and greasewood. On the higher mesas and on the foothills there is a growth of scrub cedar and juniper; still higher these give way to dwarf pinyons, and then to giant pines, which are found up to the very summits. In the region of the giant pines there is excellent pasturage and a perennial, although scanty, supply of water, and to these regions the flocks are driven in the summer. Here also there are many little valleys with wonderfully rich soil, and the season is long enough, although the elevation is over 8,000 feet above the sea, to mature a crop of corn.

On the western slope of the Tunicha Mountains, which is the name of the range referred to, half a dozen small ditches have been put in by the Indian Office with a part of the appropriation and the work is still in progress on a small scale. The work already done has been a potent factor in the industrial revolution alluded to, and as time progresses its influence will be more and more widespread; for although the Navahos have never done work of any kind, except such as is incidental to war and forays, they are anxious to learn and now need only a little fostering and encouragement.

VIEW NEAR THE HEAD OF WHEATFIELD DITCH.

The northernmost of the ditches is in the Carriso Mountains, as the northern end of the range is called, near the locality of the recent excitement over gold diggings which did not materialize. A number of Indians are now cultivating small patches of land here. The Tse-a-lee ditch, in a beautiful valley of that name on the western slope of the mountains, is about two and a half miles long. The water is taken out of a little stream by the aid of a crib dam about 100 feet long, and practically the whole stream is diverted into the ditch. The cost of the work was about $2,000, and there are 1,000 acres under the ditch; but the supply of water is not sufficient to cover all of this land, although with rigid economy of water which characterizes the Indian, either for personal use or for irrigation, it will go far toward it. This ditch was one of the first built, and when the Indian Office failed to clean it out in the spring of 1896 the Navahos took the matter into their own hands, and not only did this work, but also repaired a break about 200 feet long, caused by the spring floods. Such action indicates a pronounced and permanent interest in the work.

About six miles south of the last mentioned place there is another valley, known as the Wheatfields, because of a tradition that, long ago, wild wheat grew there in great abundance. It is a beautiful valley, sheltered by the forests of giant pines which border it, and with a rich black soil, needing only irrigation to be wonderfully productive. In this valley the most important ditch of the group is located; it is three and a half miles long and cost $3,500. Here also the whole stream is diverted by the aid of a dam 140 feet long into a ditch which delivers it upon one side of the valley. About a mile below the dam there is a peculiar aqueduct by which the ditch is carried over an arroya or little gulch. At the time the ditch was built it was impossible to procure lumber for the making of a flume, and as a heavy additional expense would be incurred by carrying the ditch around the gulch on grade, the difficulty was met and overcome by the building of a bridge or causeway of heavy pine logs, 100 feet long and 26 feet wide. The water runs in an earth bed on top of this structure; in other words, the ditch construction was carried right over the log bridge. Although this appeared to be a clumsy, and was regarded as a temporary expedient, two seasons have passed since the structure was built, and dur-

IRRIGATION NAVAHO RESERVATION—THE AQUEDUCT, WHEATFIELD DITCH.

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ing both the ditch ran full of water without developing a leak.

About twenty miles south of the Wheatfields a wagon road comes up from the south and crosses the mountain through the only practicable pass in the range. This is known as Cottonwood Pass, and near it, occupying a small valley, there is another ditch. This is one and a quarter miles long and its total cost was about $650. It is noteworthy that since the ditch was built every foot of land under it on that side of the valley has been fenced in by the Indians and nearly all of it is now under cultivation; whereas, before its construction, none of the land was used. There are also several other small ditches and a large storage reservoir, the work on which is not yet completed.

The ditches are simple earth structures of from four to eight feet bottom width, with an average earth cut of two feet, and capable of carrying if necessary a stream of water nearly four feet deep. But they usually carry from one foot to eighteen inches only, and not all of this water is utilized at present. The average cost of putting water on land throughout the arid region has been about $8 per acre, and of works in the vicinity of the reservation about $12 per acre. Here it has been less than $5 per acre. The reason of this is that the work was done in the most favorable localities that could be found and almost entirely by Indian labor, at $1 per day, without board. The problem of a market for products, which enters so largely into irrigation schemes, was not considered in this work.

At the time the work commenced few of the Navahos knew anything about manual labor. The commonly accepted idea of the Indian as essentially a loafer depending on the work of his women and considering all labor beneath his dignity, does not apply to these Indians. They had never done any work, merely because there was no work to do. There was always great rivalry among them to secure places on the work, and nine-tenths of the adult males in the tribe could have been put to work had it been practicable. As it was, as many as 300 were employed at one time.

They seemed to want the work because they liked it, and not because they needed it. To them it was a huge picnic. The old idea has come down to us from the far distant past that work is more or less of a hardship, but these people seemed to have some different point of view from ours and regarded it as a pleasure. If this mental attitude could be acquired in some school, such school would be a valuable adjunct to modern civilization. Out on the line, where there were from 60 to 200 Indians at work under white and Indian foremen, the greatest good humor always prevailed. Pithy, sententious statements and epigrammatic phrases were the order of the day, and everyone took part in a stream of chaff and badinage which flowed without intermission during the eight hours which constituted the working day.

With it all the amount of work accomplished in a day was wonderful. It was not unusual to measure off sections of the work and race through them for the mere fun of the thing, and the amount of earth moved in a day under such circumstances was a revelation. At times dirt was taken out and spread on the banks for five cents a cubic yard; to move the dirt with horses and scrapers would have cost in this locality from twenty-five to thirty cents a cubic yard. This comparative low cost of hand work could be attained only under conditions exceptionally favorable to that form of labor. On a larger ditch the advantage would have been with the horse scrapers.

The native interest in the work is very great and applications to the engineer in charge for the building of small ditches here and there throughout the reservation were made almost weekly. Many little ditches have been built by the Indians themselves since this work was commenced, necessarily without instruments, and with crude implements; and it seems probable that the effect of this work will be to change a bloodthirsty, warlike people into a peaceable farming population, living by their own labor and not on that of their neighbors.

TOKIO has adopted the arch system for the two miles of elevated railroad which it has been decided to build there at a cost of $2,000,000.

### Lieut. Peary Honored.

The annual meeting of the American Geographical Society was held at Chickering Hall, New York City, on the evening of January 12. The Cullum Geographical Medal was conferred upon Lieut. R. E. Peary, U. S. N., in consideration of his brilliant Arctic explorations. The Cullum Geographical Medal is awarded from time to time for geographical explorations, but this is the first time that the medal has been given. After the medal was presented by Judge Daly, Mr. Peary received it and expressed his thanks to the society for the high honor having been conferred upon him. He then devoted his remarks to outlining a plan for reaching the North Pole. He said that the pole was certain to be soon reached, and that it was now only a question of time and money. His own expedition had convinced him that, with a sufficient depot of provisions and equipment in the latitude of Independence Bay, the pole is attainable. He believes that the results of his own expeditions, together with those of Nansen and Jackson, show that there is left but one practical route by which to attain the North Pole, and that is the route through Smith Sound and along the northwest coast of Greenland.

Mr. Peary explained the objects and plan of the proposed work as follows, as reported by the New York Sun:

"The conquest of the North Pole, the complete delimitation of the Greenland Archipelago, the last of the circumpolar island groups, and the elimination from our maps of the unknown area between the eighty-fourth parallel and the pole, are important geographical desiderata. This work can be accomplished without risk of life or health. It can be done at comparatively small cost.

"My plan is to raise a fund sufficient to insure the continuation of the work of exploration for ten years, if necessary, say $150,000, and deposit it in a trust company, purchase a ship, give her a minimum crew, load with concentrated provisions, proceed to Whale Sound, take on board several picked families of my faithful Eskimos, with their tents, canoes, dogs, etc., force a way through Robeson Channel to Sherard Osborne Fjord or further, and land people and stores, then send the ship back.

"As soon as the freezing of the ice in the great fjords of the northwest coast would permit sledge travel, the work of advancing supplies northeastward along the coast would be commenced, taking comparatively short stages and light loads, so that the trips could be quickly made. As soon as the supplies had been advanced the first stage, the party itself would move forward, leaving a cache behind, and as they would be following Eskimo customs and living in snow houses, this could easily be done.

"Then the second stage of advance would be taken up and the work carried on until the departure of the sun. Each of the brilliant winter moons of the polar night would afford opportunities for continuing it, so that early spring should find the party and the bulk of its supplies located at the northern terminus of the North Greenland Archipelago, probably not far from the eighty-fifth parallel, with caches behind it at each prominent headland.

"From this point, when the proper time came, with picked dogs, the lightest possible equipment and two of the best of the Eskimos, the dash for the pole would be attempted, with strong probabilities of a successful termination.

"Should the first season be unfavorable as regards ice conditions, it could be devoted to a detailed survey of the archipelago itself and a reconnaissance of the east coast as far south as possible, and the northern journey reserved for the following season or the next.

"Each succeeding summer the ship would attempt to establish communication with the party's base, succeeding probably every other year at first, then with increasing experience every year, and keep up its supply of food, dogs and Eskimos until the objects of the expedition were accomplished.

"Should the ship be unsuccessful in the passage of Robeson Channel the first year, the party should land at Hayes's Sound and devote the first year to explorations of that unknown region. Retreat from the colony at Sherard Osborne Fjord would always be practicable across the inland ice to Whale Sound.

"Here let me call your attention to a few points on which you must accept my dictum, as I have no time to enlarge. Arctic exploration may be regarded as safe. This is shown by the experience of the last ten years. Nothing is to be gained by numbers; in fact, numbers are a distinct danger, and the frightful catastrophes of previous work are, in my opinion, directly traceable to that cause. The entire animus of the Arctic regions is against large parties. Where three men will get along in safety and comfort, six would merely exist on half rations and twelve die of starvation. The two-men party is the ideal one. Both Nansen and myself have proved this.

"The leader of the expedition must be at the head of the advance party; no successful Arctic party can be led from the rear.

"The latitude of Lockwood and Brainard's furthest north is 83° 24′. The distance from this point, up to which we know there is land, to the pole and return is less than the distance from Whale Sound to Independence Bay and return, which I have twice covered, once with a single companion and again under the heaviest handicap.

"Quite likely the question comes up, 'If this method is so practicable, why has not the establishment of a base in this locality been attempted before? and why have I not attempted it myself?' It has been attempted before, but there being no means for a continued effort, failure in the first attempt has resulted in its abandonment. As for myself, it has been entirely a question of money. The funds at my disposal have not permitted the charter of a ship beyond Whale Sound.

"The points in favor of this project are:

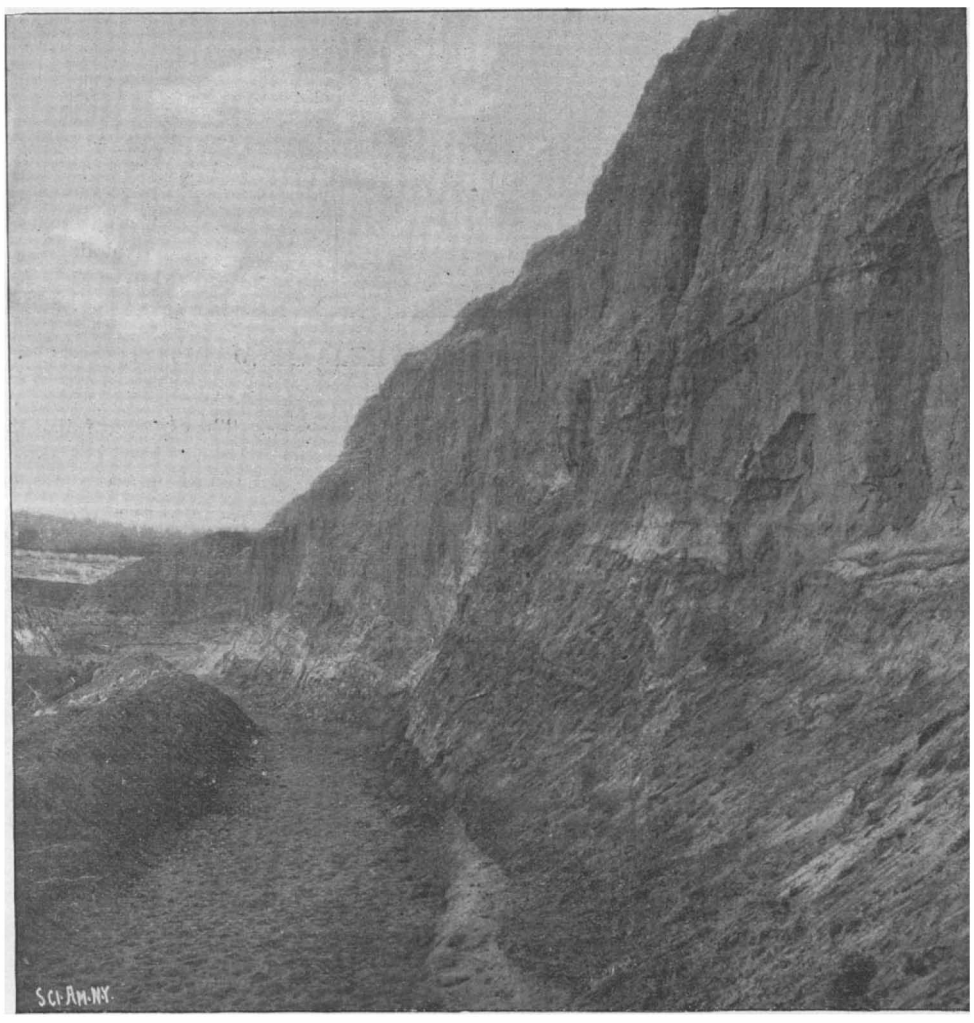
"1. The utilization of the Eskimo, the people best fitted in the world for that particular kind of work—men who, under the leadership of one whom they know to be their friend and in whom they have the utmost confidence, would follow to the end, faithful and loyal as their own magnificent dogs.

"2. Land for a base. The party launched into the icy waste from the Northern Archipelago would have some definite, fixed point to which to return, rather than a ship drifting with the drifting ice, to vanish like a will o' the wisp, as did the Fram from Nansen. Then, should the party be swept westerly in its retreat, it would still strike land, and finding depots at each prominent headland, could easily reach headquarters.

"3. A practicable and already utilized route for a retreat independent of the ship or outside assistance.

"In a nutshell, my project means: First, the raising of a sum sufficient to insure persistent, continued effort, so that if the attempt fails the first year it can be repeated the next, and the next and the next until it is done.

"Second, the establishment of a party of picked Eskimo families, a surgeon, and an experienced leader at the highest practicable point on the northwest coast of Greenland; with ample supplies, means of communication, which would enable the colony to sustain itself




A HEAVY CUT ON THE TRI-A-HI DITCH.

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until its work is accomplished, and with a practicable line of retreat entirely independent of the ship.

"This project, in more detail and accompanied by maps, will be placed before your council, in the belief that it will meet the approval and indorsement of the society. With that indorsement, I believe the time is opportune for raising the money for the work."

### A THEATER WITH TWO AUDITORIUMS.

The people of New York City have the reputation of being the most industrious theater-goers in all America; a statement which is verified by the ever-increasing number of large and well filled places of amusement. Of late years the growth of the popularity of the style of entertainments which are classed under the name of vaudeville has called into existence a special type of theater, which, in addition to the regulation stage and auditorium, includes special halls of entertainment, with lounging rooms, cafés, etc., and, for use in the hot summer months, the inevitable roof garden. To judge from the nightly programme of a first class house of this type, the excellence of the performance is measured, after its quality, by its length and variety. The more rapidly the various artists can make "their exits and their entrances," the more concentrated amusement can be packed into any given hour of a "continuous performance."

It was with a view to enlarging the stage capacity that the proprietor of Proctor's Pleasure Palace, in New York City, resorted to the bold expedient which is shown in the accompanying illustration, from which it will be seen that a single stage is made to do duty for two separate auditoriums. The way in which this was accomplished will be seen by reference to the sectional diagram, which is taken longitudinally through the auditorium proper, the stage, and the new auditorium, which is known as the Palm Garden, being so named after the palms and tropical plants and vines with which it is decorated. That part of the diagram which includes the auditorium and the stage shows the construction of a typical theater of to-day—the roof garden and the café in the basement being special features in a house of this kind that introduce no new structural features of much consequence beyond a strengthening of the roof supports. Stripped of its galleries and scenery, a theater consists of two four-walled structures, the auditorium being about square in plan, and the stage floor about the same width as the auditorium and half the depth. The walls of the stage are carried considerably higher than the roof of the auditorium, in order to accommodate the "drop curtains," which are hung by ropes that pass over pulleys attached to what is known as the "gridiron," a stout framework located near the roof of the "scene loft." When the "drop curtains" are not in use they are raised clear of the "proscenium," as the opening from the stage to the audience is called, and hang in parallel rows as shown in the diagram. Below the stage floor are shown the "traps," which are used for the disappearance of Mephisto and people of similar subterranean proclivity. Here, in the older theaters, were frequently located the dressing rooms of the performers, though the more modern arrangement is to build them at the sides or to the rear of the stage.

In carrying out the idea of a double stage a hall was built immediately behind the theater proper, and a proscenium arch was cut through the rear wall of the stage, the floor of which was carried out into the hall and provided with the regulation footlights. The new proscenium was provided with its own curtain, and all that was then necessary was to paint the backs of the existing wings and drop curtains with scenery, and the doubling of the stage was complete.

The original intention was to have three or four performances of such a character that they would not interfere with each other going on upon the stage at the same time, and during the summer months this was frequently done. Ordinarily, however, the curtain opening to the palm garden is kept lowered, and it is raised only during the intermissions, or when special acrobatic, gymnastic or animal acts are in progress. A passageway leads from the auditorium to the palm garden, which are both accessible to the audience at all times.

This is the first time that such an experiment as this has been tried, and its results will be watched with considerable interest. The effect as one looks through the stage may be judged from the larger of our engravings.

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ON March 31, 1896, eighty-three men-of-war were building at English ship yards, having an aggregate tonnage of 312,375 tons. Sixty-four of these were for the British navy. Fifteen ships were under construction in the government yards, and at the private yards forty-nine vessels were building for the British navy, including thirty torpedo boat destroyers of a speed of 30 knots. The navy budget of the current year provides for the construction of sixty torpedo boat destroyers of a speed of from 30 to 33 knots, at a cost of $300,000 each. There are to be built besides four battleships, four first-class cruisers, six third-class cruisers, or seventy-four ships in all.—Stahl und Eisen.

### Recent Patent and Trademark Decisions.

Tuttle v. Claflin (U. S. C. C. A., 2d Cir.), 76 Fed., 227.

Plaiting Machine.—The Crosby & Kellogg patent, No. 37,033, for a machine for crimping textile materials, has been held valid and construed.

Accounting for Profits in Infringement.—Where an infringer makes no addition to the patented machine, but merely uses mechanical equivalents which may produce better work than the corresponding devices for which they were substituted, he is bound to account for the profits he has reaped, and they will be measured by the difference in the expense of doing the work by the device and by the method used prior to the patent. But if an infringer takes the whole of the vital and effective parts of an invention and superadds an improvement which contributes to the saving over the old methods, then the infringer is liable for the difference in expense of doing the work by the device and by the method used prior to the patent, after deducting the portion of the profits that accrued from the improvement added by the infringer; the amount of the profits accruing from the improvement must be established by the infringer. Where the infringer used the essential parts of the patented machine without which his infringing machine was worthless, it is not necessary to demand an accounting of profits that the equivalents substituted by the infringer improved the work of the corresponding elements of the infringing machine.

Marking the Article "Patented."—Where the pleadings are silent on the question of whether the complainant marked its article as patented or notified defendants of their infringment and the question was never actually raised or decided in the court below, the point cannot be raised upon appeal from the final decree.

Ascertainment of Profits by the Court of Appeals.—Where a suit for infringement had been pending for eighteen years and had been before three masters for an accounting and finally resulted in a decree for nominal damages only, the Court of Appeals, upon deciding that the complainants were entitled to recover a substantial sum, did not remand the case to the court below for further proceedings, but did itself determine the proper amount and render a decree therefor.

Ex parte Fratsch (Comr.'s Dec.), 77 O. G., 1427.

Use of Copper Matte to Purify Oil.—The use of pulverized matte to remove the "skunk" from oils is an improvement upon the use of a mixture of pulverized copper oxide and pulverized iron oxide such as would not be expected from those versed in the art, and therefore amounted to invention.

Couch v. Finnigan (Comr.'s Dec.), 77 O. G., 1595.

Acquiescence by Conduct.—In this case one of the parties, after learning of the other's patent, continued to make the patented article and did not object to the other marking his article patented, and even did not claim the article as his own invention until after his employers became involved in trouble with the other parties. It was held that this conduct was not that of a person who had actually made the invention.

Failure to Claim the Invention in a Prior Patent.—Where a party obtained a patent which disclosed all the improvements embraced in an interference contest before he filed his interference application, but his prior patent contained no claim for the matter in contest, this would indicate that he would not consider himself the inventor of such matter.

Bryant v. Seymour (U. S. C. C. A., D. C.), 77 O. G., 1599.

Delay in Appealing.—The rules of the Circuit Court of the District of Columbia provide that an appeal shall be taken within forty days of the Commissioner's decision and not afterward. In this case the appeal was taken nearly a year afterward, without any excuse for the delay being given. The court decided to adhere to the rules, and therefore dismissed the appeal.

Hien v. Pungs (U. S. C. C. A., D. C.), 77 O. G., 1600.

Time for Appeal to the Court of Appeals of the District of Columbia.—There is no justification for the theory that a party has two years in which to take an appeal from the Commissioner of Patents to the Court of Appeals of the District of Columbia on the ground that the statute gives an applicant a possible two years within which to prosecute his application. The right of appeal is not a vested right that may be altered by statute or by rules of court. If there was no rule in force at the time the Commissioner's decision was made, it applied to the case as soon as the rule was promulgated.

Pelton v. Evered (U. S. C. C. A., D. C.), 77 O. G., 1600.

Failure to Print Record.—An appeal from the Commissioner of Patents to the Court of Appeals of the District of Columbia will be dismissed, if the parties failed to print the transcript of record as provided for by the rules of the court.

Mackintosh Battery and Optical Company v. Bertman (U. S. C. C. A., 7th Cir.), 76 Fed., 368.

Electrical Machines.—The Atkinson patents, No. 275,347 and No. 331,754, for improvements in machines for generating static electricity, are void for want of invention.

### Notes on Acetylene.

The following notes on acetylene are extracted from recent technical journals:

Mr. P. C. Frewin, F.C.S., U. S. A., says: "I filled an iron ball with acetylene to a pressure of five pounds to the square inch, and then subjected it to a series of blows from a large sledge hammer. Although the ball was bent all shapes, there was no explosion, neither has there ever been to my knowledge through this cause. Acetylene has a chemical action on pure copper, but none of a dangerous kind on brass. A series of experiments have been conducted by me before the Chemical Society of New York, and they all go to prove this. Several insurance companies in England are at present willing to insure houses, etc., lighted by acetylene, and, no doubt, in a short time, all will do so. I may add there were last year 730 people using acetylene as a general illuminant in New York, and that only three accidents occurred—two through escapes and one through a generator being charged with a candle close by—conditions under which coal gas would have acted just the same."

M. Brevans says that if ordinary acetylene from carbide be passed through a series of three washing flasks containing a solution of sulphate of copper, there is no effect perceptible within three hours; but after twelve hours the first flask contains a black-brown, brilliant precipitate, the quantity of which goes on increasing for as much as eight days, says the Gas World. This precipitate explodes on shock, friction, or heating, and it appears to be a mixture of phosphide and silicide of copper, of sulphate of cupro-acetyle, and a variable quantity of acetylide of copper. Its production appears to depend largely on the presence of ammonia in the crude acetylene gas; and it shows that the crude acetylene contains phosphureted hydrogen and siliciureted hydrogen. The second flask contains a precipitate which is similar in appearance, but less explosive; and the precipitate in the third flask is not explosive. The explosive precipitate in the first flask will explode even under water, as, for example, when we try to rub it off the glass with a glass rod. As to the explosibility of acetylene there are two opinions: one that there may be metallic acetylides formed, which act as detonators to the acetylene itself, so that acetylene cannot be used with reservoirs which are capable of being attacked by it; the other that it can only be exploded when mixed with air, and that the influence of the outside explosions which can set it off cannot travel far through air. In any case, acetylene at a pressure not much exceeding that of the atmosphere is not explosive, though it is explosive at pressures above two atmospheres; so that there is no reason to fear an explosion through flame running back to a reservoir under a very small excess of pressure. Shock alone does not appear to cause explosion of the gas, only of the acetylides. The alleged poisonousness of acetylene—which has not, as yet, given rise to any accident—would appear to be due to the occasional presence of cyanogen compounds, and is not a feature of pure acetylene. The presence of sulphureted hydrogen in acetylene seems to depend on that of sulphide of aluminum in the carbide of calcium; sulphide of calcium may exist in it without forming this impurity. The blocking of gas jets by acetylene flames seems to be due to the formation of phosphoric acid. If oxygen be not present, acetylene does not attack copper; the oxide must be formed before the acetylide can be produced.

M. N. Grehant's experiments at the General Physiological Laboratory of the Paris Natural History Museum have shown that one volume of acetylene consumes during combustion two and a half volumes of oxygen, and yields two volumes of carbonic acid, thus favoring the belief that the combustion of this gas is complete, no combustible mixture containing carbon being generated. In order, however, to ascertain whether the products of combustion contain a trace of combustible gas, he tested them in a continuous grisoumeter, with platinum spiral kept incandescent by galvanic accumulators, and only obtained, during two hours, from 79 cubic inches in a baryta tube, a ring, scarcely visible, of baryta carbonate, showing so slight a trace of carbonic acid that it could not be determined. In another experiment an India rubber bag filled with acetylene gas, subjected to a pressure of 1½ inches of water, supplied a Manchester burner placed underneath a metal cone, connected by a refrigerator with two metal valves, and a muzzled dog breathed the products of combustion for half an hour. In the grisoumeter, 2½ inches of normal arterial blood showed a reduction equal to 3·7 divisions, while the same quantity taken at the end of the experiment showed a reduction of 3·8 divisions. M. Grehant concludes that the products of combustion given off by acetylene, when a Manchester burner is used, are free from the slightest trace of combustible gas containing carbon.

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THE Duryea Motor Wagon Company, of Springfield, Mass., have received from the Motor Car Club, of London, a gold medal in recognition of their splendid performance in the London-Brighton run on November 14, 1896.

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## SOME PACIFIC CAVES.

BY C. F. HOLDER.

The Pacific coast lacks the grandeur which the plutonic rocks of the New England shores give to the Atlantic, yet there are many picturesque sections where the waves have cut the rocks into strange and picturesque shapes. At Santa Monica there is a fine natural bridge, which, if better known, would attract wide attention. It is a lofty arch, forming part of an adjacent mountain, and at low tide can be entered, constituting the shore passage at this point of the coast.

The islands off the coast of Los Angeles and Santa Barbara Counties, Southern California, abound in some remarkable caves. An interesting one is situated on the island of Santa Catalina, which is a trip of about three hours and a half from Los Angeles. The cave lies on the eastern side near what is known as the isthmus, and from the sea presents the appearance of a large, shallow room, the entrance being, at low tide, thirty or forty feet in height. The writer's attention was attracted to it by the strange play of light on the front walls and roof, giving the impression that it was covered with the webs of spiders, moving in a tremulous manner. At the entrance the water is so deep that the largest ship could thrust the tip of her bowsprit into the cavern, and of a rich blue, telling of great depth. This blue tint directly in the entrance of the cave has given the name Blue Cavern to the great opening in the rock.

Pushing a boat in, one is surprised to find a small tunnel branching off to the right—the real cave. The writer entered this in a small boat one day when the tide and sea were low, and penetrated it without difficulty. The water was about six feet deep, over a perfectly level floor covered with pebbles and seaweeds, while here and there could be seen the sparkle of the pearl of the abalone. The sides were too narrow to use oars, and the wall so low that every wave that came rolling in through the tunnel lifted the boat unpleasantly near the roof, showing that at very high tide, when the wind was fresh, the attempt to enter the Blue Cavern might be accompanied with some danger. By standing up and pushing the boat by hand, using the sides and roof, the passage was easily made for about one hundred and fifty feet, the boat suddenly coming out around a point some distance from the main entrance. For unknown centuries the waves have been working at this cave, gradually eating it out, with the result given. At night, when the waves roll in, the spectacle here is a grand one. The seas passing through the long tunnel burst into the larger cave, sweeping up against the sides and bathing them in a rich phosphorescent light that falls in gleaming rivulets down the black walls, producing a weird and spectral effect. Not far from here are several smaller caves below the water, which emit strange noises as the waves are forced in, while one sends out, apparently from the very rock itself, a mass of spray, appearing like a geyser.

The most imposing cave of all in this region is found upon the island of Santa Cruz, off Santa Barbara, about twenty-five miles from the shore. The entrance of the cave is about forty or fifty feet at an estimate, no measurement having been made, and from it one can look directly into a series of chambers for an estimated depth of an eighth of a mile, nearly all of which can be traversed in a small boat.

The first chamber excites the wonder of the visitor as to how it could have been formed, the roof being far above the reach of waves, except in the fiercest storms. It has been suggested that originally the cave was at a lower level or partly submerged; that it was worn away beneath the water, and that the island has since risen, thus elevating the roof high above the sea. Be this as it may, the vast cave stands one of the wonders of the Pacific coast. It is to be regretted that it is so isolated and beyond the reach of the traveling public, no regular passenger boat running to the island, as in the case of Santa Catalina.

In entering the great cave of Santa Cruz the splash of the oars reverberates from wall to wall, and one realizes what was meant by the line

"Dark unfathomed caves."

The water is as clear as crystal and of a delicate green. In the opinion of many, the effect of coloring is more beautiful than at Capri. One feels that he is entering a vast temple dedicated, perhaps, to Neptune. The first hall or chamber rises at the entrance perhaps fifty feet, but as the boat passes slowly on, the second hall and coming wonder is seen to be of loftier dimensions, and carrying out the idea of some old cathedral.

Owing to the large entrance, and that the cave opens in a straight line for some distance through a series of arches, it is well lighted, which brings out one of the remarkable features of the rooms. They might have been ornamented by design, so beautiful is the coloring and soft blending of green, red, yellow and brown, all the rich possibilities which come with the presence in rock of sulphur and copper. The walls are strangely infolded, as though the cave had been an enormous blow hole for a volcano. The splendors of this wall decoration appear to be imparted to the submerged floor, which is covered with delicate seaweed that seems to flash with iridescent tints.

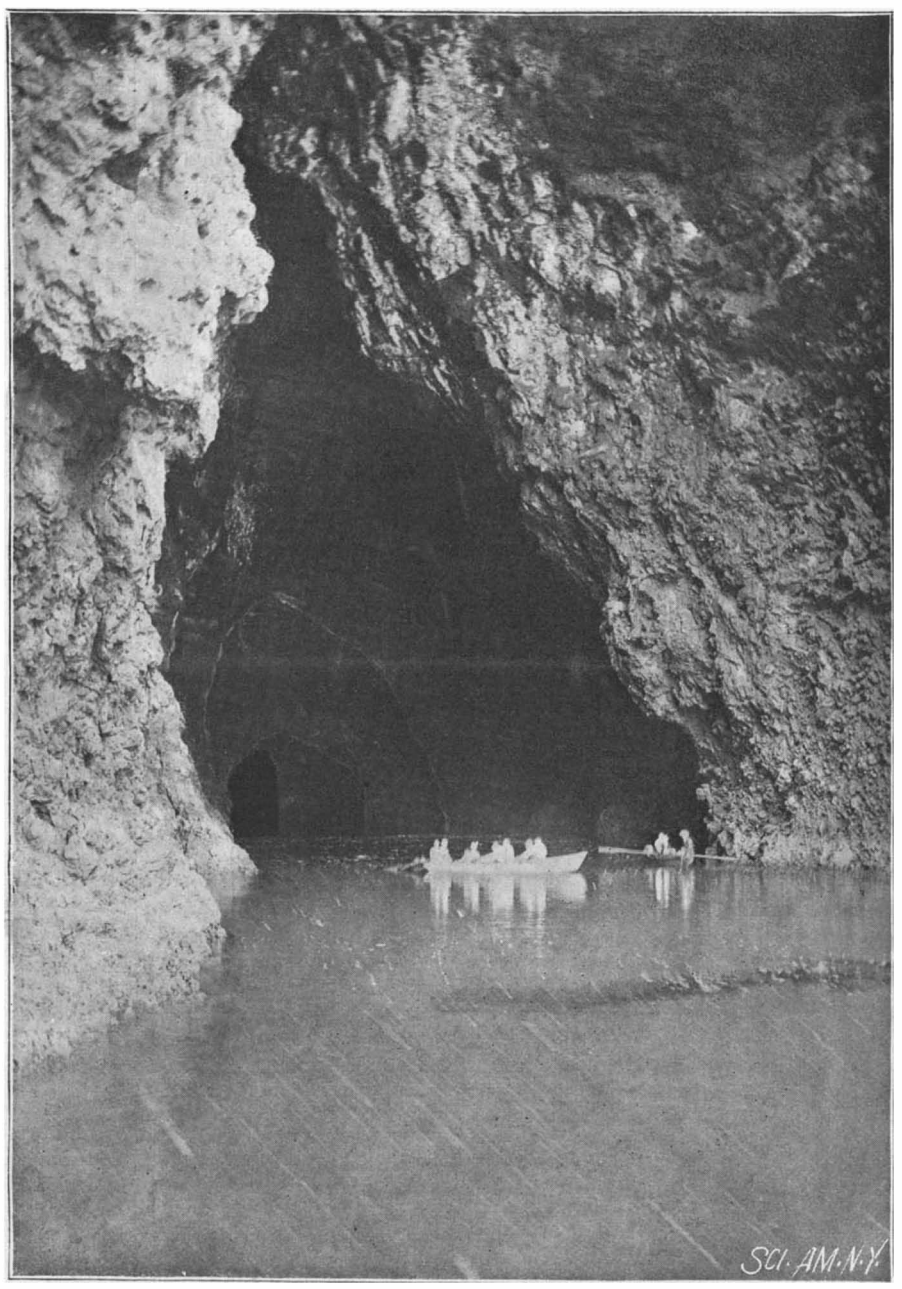
As the boat enters the third and fourth chambers the reverberations increase, and the breaking of the waves on a little beach far in the interior is heard; then suddenly comes a terrific barking that, thrown back from wall to wall, has been sufficient in times gone by to appal the stranger. But the Californian recognizes in the rumble and roar the voice of the sea lion that has pre-empted some of the rocks in the inner cave and resents the intrusion.

The full length of this cave has never been reached, and careful investigation would probably show that this remarkable cavern pierces the bluff of the island to a much greater depth than is generally supposed.

Twelve miles north of San Diego, at La Jolla, the coast is cut and worn into numerous caves, many of which are of remarkable size, ranging from fifty to two hundred feet in height, some being four hundred feet in width and extending from four to six hundred feet into the cliffs, which present a singularly picturesque appearance. The stratification is plainly outlined, and at various points has been broken; in this way affording an opening wedge to the water, which has gradually worn the sandstone rock away.

This is especially noticeable in the western cave, about whose entrance are strange, fantastic shapes of rock, worn by the sea. This cave is a miniature cathedral dome, its walls ornamented in a marvelous manner. The sea breaking into this vast chamber reverberates like the booming of cannon, and finally makes its way out through another passage.

There are eight or ten large caves in the high cliff, which can be entered, and scores of smaller ones which are being slowly enlarged by the sea.




CAVE OFF SANTA BARBARA SANTA CRUZ ISLAND, CAL.

### Telegraphy Without Wires.

An invention which promises to be of the greatest practical value in the world of telegraphy has received its first public announcement at the hands of Mr. W. H. Preece, the telegraphic expert of the London post office. During the course of a lecture on "Telegraphy Without Wires," recently delivered in London, Mr. Preece introduced to the audience a young Italian, a Mr. Marconi, who, he said, had recently come to him with a system of telegraphy without wires "which depended, not on electro-magnetic, but on electro-static effects, that is to say, on electric waves of a much higher rate of vibration, not less than 250,000,000 a second; that is, Hertzian waves." These vibrations were projected through space in straight lines and, like light, were capable of reflection and refraction, and, indeed, they exhibited all the phenomena which characterized light.

Telegraphing without wires was, of course, no new idea. Mr. Preece stated that in 1884 operators in the telephone exchange, London, were able from sounds heard to read messages that were in transit from London to Bradford by the telegraph wires. The post office wires were underground and the telephone wires above ground, and careful experiment showed that this fact accounted for the telegraphic messages to Bradford being read by the telephone company. In 1893 telegrams were transmitted a distance of three miles across the Bristol Channel by induction, and during a break in the cable connecting the island of Mull with the mainland communication was established by means of parallel wires as follows: On the mainland an insulated wire was laid along the ground, earthed in a running stream at one end, the other end being in the sea. Skirting the coast of the island was an overhead wire suited to the purpose. In the course of four days one hundred and fifty-six messages were dispatched.

The invention of young Marconi solved the problem on entirely different principles. The post office officials had used it successfully on the roof of the general post office, and then made a successful test on Salisbury Plain at a distance of three-quarters of a mile. The great difference between the Marconi and the inductive methods of wireless telegraphy was that the former did away entirely with the wires at each end. Vibrations were set up by one apparatus and received by the other.

The apparatus shown at the lecture consisted of two plain boxes which were placed at opposite ends of the hall. The current was set in motion in one box, and immediately a bell was rung in the other. Mr. Preece said that the British post office authorities had decided to spare no expense in experimenting with the apparatus and one of the first trials would be from Penarth to an island in the English Channel.

If the experiments were successful, it would be of inestimable value to shipping, for it would provide another easy way of communicating with lightships and lighthouses. To take an instance: Since last year they had had a cable with the Fastnet Light (the first light seen by Atlantic voyagers), but in the early part of this year it broke down, and they had never been able yet to land on the rock in order to repair it. But there was a possibility beyond this of enabling ships as they came near dangerous rocks and shallows to receive an intimation of the fact by means of these electric waves. Neither day nor night made any difference, fog or rain or snow would not interfere with them, and if the invention was what he believed it to be, our mariners would have been given a new sense and a new friend which would make navigation infinitely easier and safer than it now was.

THE brigand Tiburzi's brain was given after his death to Professor Lombroso for examination. The professor is obliged to admit that it is perfectly normal, as are all the criminal's other organs, but he saves his theory by calling him a criminaloid. By that he means a man whose natural qualities are not bad, but who becomes an outlaw only technically. Under more favoring circumstances, he thinks, Tiburzi might have become a leader of mercenaries like Sforza, or a founder of a state. He dodges the point that the man was a murderer and a thief.

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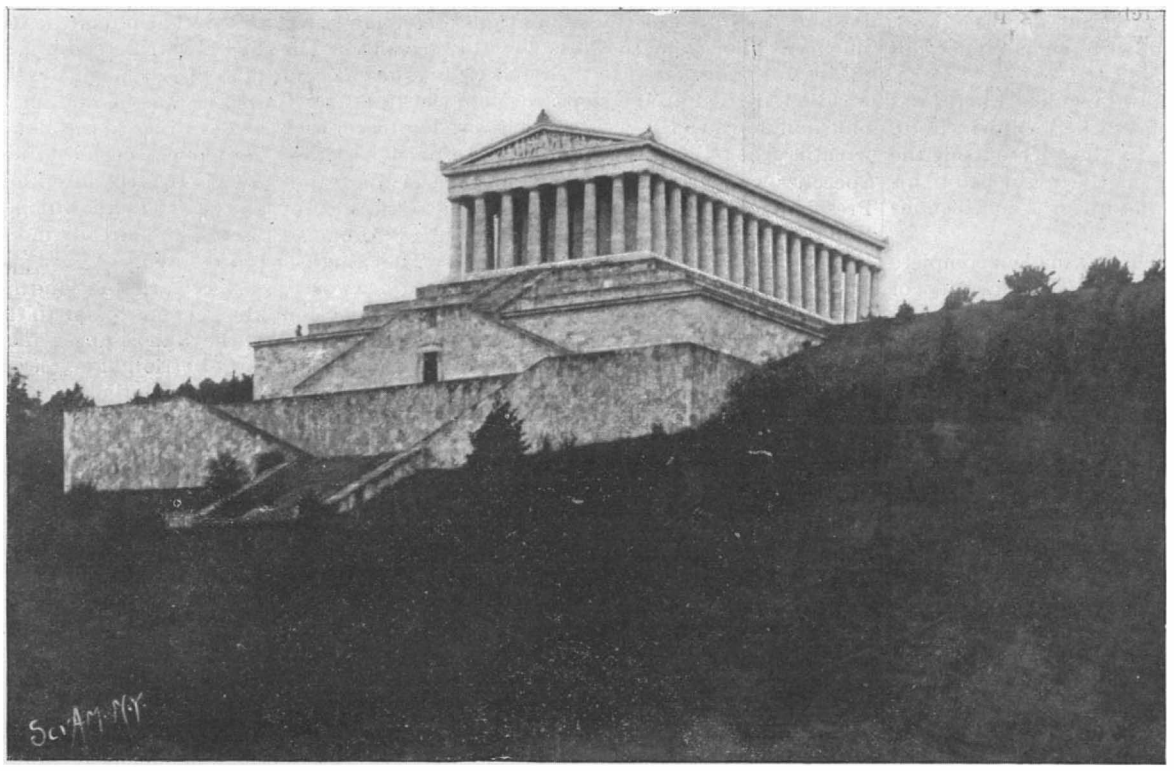
## THE WALHALLA OF RATISBON.

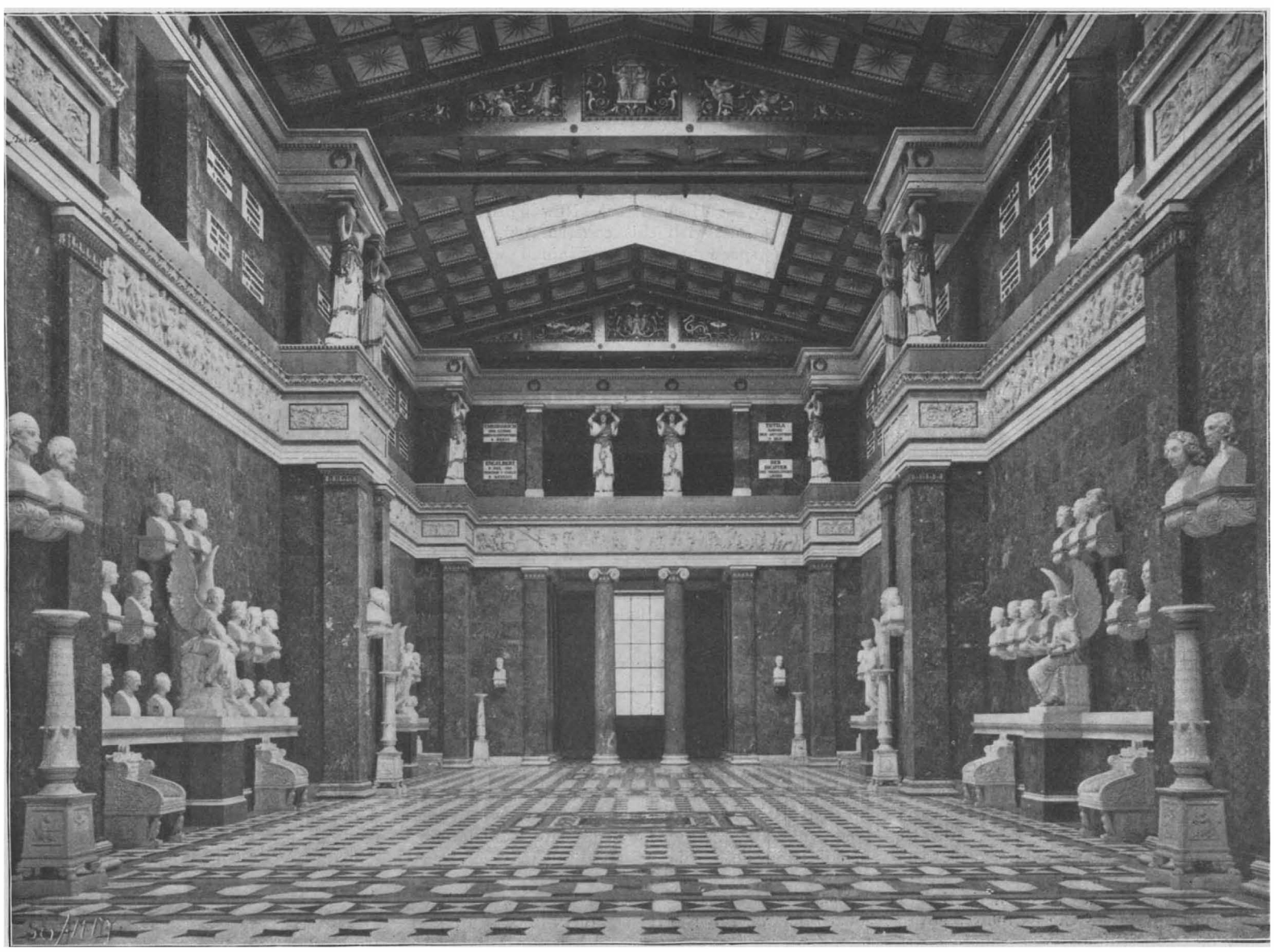
The ancient city of Ratisbon, the old capital of the Upper Palatinate, is situated on the Danube, in the heart of Bavaria. It is a pleasant old town and in many ways it is as interesting as the better known Nuremberg. Ratisbon belongs to an earlier period than Nuremberg. Most of the streets are narrow and many of the older houses have strong towers provided with loopholes which bring back to mind the days when civic broils were of frequent occurrence. The interesting "Street of the Ambassadors" contains the former residences of the ambassadors to the Diet. Ratisbon possesses a small but pure Gothic cathedral. The Rathhaus is a gloomy building; here the visitor is conducted to the subterranean chambers and dungeons, and here is the rack in situ. The instruments of torture are vastly more horrible when seen in these terrible prisons than when seen behind the plate glass of museum cases. Crossing the old stone bridge of the twelfth century, the small town or suburb of Stadt-am-Hof (which is really a suburb of Ratisbon) is reached. Here the train is taken for Donaustauf, where the famous Walhalla is located. The little narrow gage train runs for six miles through a beautiful country.



THE WALHALLA AT RATISBON.

The Walhalla derives its name from the "Hall of the Chosen," the paradise of the ancient Germanic tribes. It is a costly reproduction of the Parthenon at Athens. It is built on a densely wooded hill 323 feet in height. From the village of Donaustauf the ascent is made by a carriage road or a foot path which ascends to the grand flight of 250 steps, by which the edifice is approached. This "German Temple of Fame" is an architectural folly begun by King Lewis, of Bavaria, in 1830, after designs furnished by the architect Kleuze. It was finished in 1842, at a cost of about $6,000,000. This temple is devoted entirely to the display of the busts of distinguished Germans and has no utilitarian value, and is a crowning example of how money can be misspent. The building proper is a pure Doric temple, 246 feet long, 115 feet wide and 69 feet high. The building rises from massive substructions which somewhat dwarf the building itself. It is built of unpolished gray marble and is surrounded by fifty-two fluted columns. The pediments, both in front and in the rear, contain groups in marble by Schwanthaler; the one toward the south represents "Germania regaining her liberty after the battle of Leipsic;" north, the "Hermannschlacht," or battle of Arminius. The roof is constructed of iron and is covered with copper. The interior is of the Ionic order, and consists of a superb hall 180 feet long, 50 feet broad and 56 feet high. The ceiling is richly gilded; it is deeply coffered and the rosettes are particularly rich. The lateral walls are divided into six sections by four projecting buttresses flanked by pilasters. As will be seen by the engraving, the walls are divided into two parts by a rich frieze by Wagner, representing, in eight sections, the history and life of the German people down to the time of the introduction of Christianity. The ceiling is supported by fourteen caryatides, which in this case are Walkyries (Walküren) or warrior maidens. The decoration of the walls consists of busts which number over one hundred; they are of different sizes and of different artistic merit; they are arranged in formal rows and the result is rather lugubrious. The lowest ones are supported by pedestals, the upper ones by consoles. The busts include those of Goethe, Schiller, Dürer, Luther, Lessing, Mozart, Kant, Blücher, Frederick Barbarossa, etc. The busts are arranged chronologically and are separated by six admirable Victories by Rauch. Above the upper moulding are laurel wreaths in bronze, and let into the wall are sixty-four marble slabs containing the names of the celebrities who are admitted to a position on the walls of the Temple of Fame. At the farther end is the "opisthodomos," separated from the principal hall by two Ionic columns. The general effect of the interior is grand and impressive, although it must be admitted that it partakes of the funereal. The association of classical architecture, barbarian paradise and modern German celebrities is incongruous. The floor is so fine that no visitor is admitted until he dons immense felt slippers. The views of the dark slopes of the Bavarian forest and the Danube are very fine.

At Kelheim, 18 miles from Ratisbon, is another building erected by King Lewis, the so-called "Befreiungshalle," or Hall of Liberation. It is a classical edifice built by Gärtner and Kleuze. A rotunda, 191 feet in height, is borne by a substruction 23 feet high, reached by a flight of 84 steps. It abounds with fine sculpture and detail. The sanity of building constructions of this kind miles from anywhere may be questioned, and, though the building mania did not die out in Lewis' family with his death, it is satisfactory to note that, while money has been squandered as freely, its expenditure has at least resulted in the erection of habitable palaces and hunting lodges.



THE INTERIOR OF THE WALHALLA.

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### Recent Archæological News.

Chæroneia's famous lion is to be restored and set up on the battle field by the Archæological Society of Greece.

The monument to Donatello, the great Florentine sculptor, was recently unveiled in the Church of San Lorenzo in the presence of the royal family.

Mr. Flinders Petrie has been appointed executor in chief of the Egypt Exploration Fund, and the work will doubtless be prosecuted with vigor under his administration.

In St. Sepulcher's Church, in London, there was recently found in an old chest the bell which, in Stuart times, used to be rung by the crier outside the cell of a condemned criminal on the night before his execution. The bell will be hung up in a conspicuous place in the church.

The French School of Athens has made a complete archæological survey of the ancient Byzantine city of Mistrâ, on the slopes of Mount Taygetus, and has discovered many inscriptions and architectural remains, which will be exhibited at Sparta. The Greek department of public instruction has now ordered the restoration of some of the most important monuments of the place.

On St. Kilda's Island, which lies in the Atlantic, 82 miles west of the main island of the Hebrides, a house belonging to the stone age has been discovered, with a number of stone weapons, hammers and axes. There are only 71 inhabitants on the island, which is 4,000 acres in extent. The minister is at the same time the doctor and the school teacher. He sails to the mainland once a year to shop for the whole island.

Ulysses' isle of Cyclops, lying close to the Sicilian coast, near Acicasello, has been presented to the University of Catania by the Marchese Gravina, its owner. It is a basalt rock which rises 300 feet above the sea. It will now be used as a biological station, and the University of Catania will establish extensive laboratories on it.

Important restorations have been going on for more than a year at the Louvre, Paris. Alterations have been made in the old Salle des Etats, the object being to form a large gallery in which the numerous canvases of Rubens can be exhibited, and a series of fourteen small rooms in which can be placed many of the cabinet pictures which are now entirely lost with the larger works. The cost will amount to some 450,000 francs.

Dr. Orsi has recently been carrying out some excavations at Camarina and Noto Vecchio, the ancient Netum, in eastern Sicily. They have resulted in the discovery of many necropolises, both Greek and Siculan, but for the most part plundered in ancient times. Fine and intact tombs of the third and second centuries B. C. have, however, come to light at Camarina, while at Netum, besides three prehistoric burial places, Dr. Orsi has found one Jewish and several small Christian catacombs.

A number of drawings by the old masters belonging to the late Earl of Warwick were sold for $4,300 in London recently. A "Descent from the Cross," by Michael Angelo, in black chalk, brought $7,000; a head by Leonardo da Vinci, in black and white chalk, $2,400; a sheet of studies in sepia by Raphael, $1,775; two portraits by Albrecht Dürer, $2,100 each; a "Presentation of the Virgin," in red chalk, by Giovanni Bellini, $1,375; a pen and ink sketch washed with bister, by Andrea Mantegna, $825; and a pen and ink portrait of a man by Rembrandt, $750.

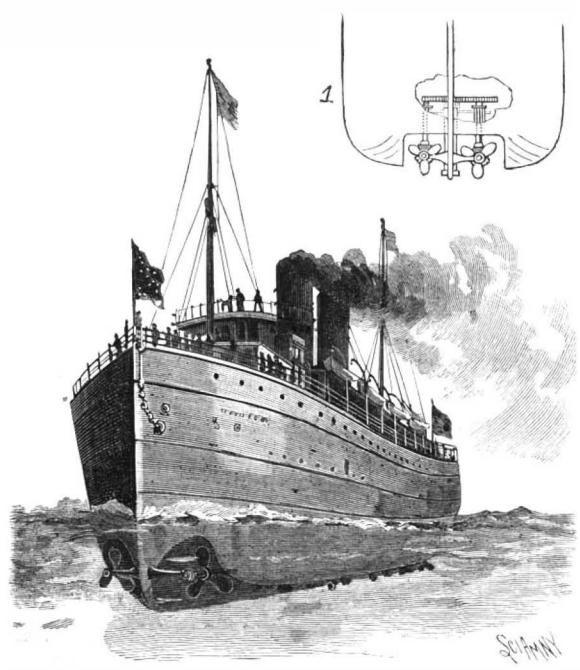
Evidence of the existence of a shorthand system among the Romans is to be found in the writings of classical authors. It was taught in the schools, and the Emperor Titus himself is said to have been an expert in its use. Suetonius ascribes the first introduction of shorthand signs, or notæ, to Ennius, who, he says, invented as many as eleven hundred; but more generally the credit of the invention has been given to Cicero's freedman, M. Tullius Tiro, whose name is commonly attached to them: Notæ Tironianæ. Seneca, B. C. 61–A. D. 32, is said to have collected the various signs or notæ known at his time to the number of five thousand. The Tironian notes were not, however, a stenographic system in the modern sense. They were symbols of words formed on certain methods, and largely at first by manipulating the initial letter. They were used for the construction of a syllabic system about the seventh century. There appears to have been some connection between Greek and Latin shorthand, certain signs being the same in both systems. It is interesting to find that the use of the Tironian notes lasted into the middle ages. Under the Frankish empire they were employed in signatures or subscriptions of charters; and they were also used by the revisers and annotators of the texts of manuscripts in the ninth and tenth centuries. Of this period also have survived volumes containing collections of the notes, indicating an impulse given to their employment; and there also exist copies of the Psalter written in these characters, as if for practice. However, they had practically gone out of use by the beginning of the eleventh century, although a few of them still survived some centuries later as symbols for certain common words.—Public Opinion.

### The Final Entombment of Pasteur.

The remains of Pasteur, which for fifteen months have been lying in the cathedral in Notre Dame at Paris, were on Saturday, December 26, borne in solemn procession to their last resting place at the Pasteur Institute, where a magnificently decorated crypt had been prepared to receive them. There was a service in Notre Dame attended by the family, the staff of the Pasteur Institute and the deputations of foreign scientific men who came to Paris for the occasion. The casket was transported to the institute in a hearse and was then carried up the steps, through the grand vestibule and down to the crypt, which was decorated with wreaths sent by English, Russian and French societies. Speeches were made by M. J. B. Pasteur, M. Bertrand, President of the Council, M. Rambaud, Minister of Education, M. Cornu, M. Bergeron, M. Perrot, M. Passy, M. Tissier, and M. Duclaux. The English speakers were Sir Joseph Lister, Sir Dyce Duckworth, and Sir W. Priestley. A feeling of restrained emotion prevailed during the ceremonies, at the conclusion of which the spectators passed respectfully before the tomb and greeted the widow and family of the illustrious investigator. The crypt is a magnificent affair, somewhat suggestive of the crypt which contains the remains of Napoleon.

### A NOVEL METHOD OF PROPELLING VESSELS.

According to the improvement represented in the accompanying illustration, lengthwise channels are formed, by means of housings, at each side of the keel of a vessel, and in each of these channels is located a shaft carrying a number of screws, the shafts being geared with vertical shafts operated by one or more motors of any preferred description within the vessel. The improvement has been patented in the United




ODINET'S PLAN FOR PROPELLING VESSELS.

States and several foreign countries by Conrad Odinet, of No. 257 West 116th Street, New York City. It is designed that, with this construction, a material increase of speed may be obtained without employing much more power than at present, and that the vessel will be able to turn as upon a pivot, the propellers acting substantially as a rudder. The propellers, placed so low down, will be constantly in the water, and never liable to "race," while they will also thoroughly ballast the vessel and add stability to the hull, being themselves protected from shot or shell in case of hostile attack. Hinged to fold close to the keel, at the forward ends of the channels, are gates by which the channels may be closed, to check or stop the forward movement of the vessel, the gates being moved by conveniently arranged levers within the vessel. In addition to the bottom propellers the ordinary stern propeller may be employed if desired. This improvement is designed for use with but slight changes in the present method of hull construction, as may be necessary in providing for the longitudinal housing on the bottom of the hull.

A UNIQUE cemetery is that in which Mr. Benjamin F. Poole, of Rockland, Mass., buries his horses and marks their graves with suitable monuments. The designs for these monuments Mr. Poole procured by submitting the matter to competition through a newspaper advertisement. One design represents a horse in an attitude of slumber in his stall, carefully blanketed, while along one side of the blanket in letters of marble are the words "Requiescat in pace." One clever artist has placed a giant horseshoe on a pedestal. Upon the pedestal's side he has drawn the cap of a jockey encircled by the variety of whip that all horsemen know so well. Another idea is an ordinary slab of marble on which is cut a horse collar, broken, with the name and age of the horse underneath.

### Science Notes.

Globus states that the waters of Lake Titicaca continue to subside with great rapidity. A large area of land has been exposed on the northern shore.

The report that Nobel, the inventor of dynamite, bequeathed his enormous property for educational uses is contradicted by Nature, though, unfortunately, the authority is not given.

A herbarium of the Russian empire is to be published by the St. Petersburg Natural History Society. The flora of European Russia will appear first, then that of Asiatic Russia, and finally that of the Caucasus.

According to the Botanical Gazette, a notable cactus garden has been established at the University of Arizona. It is the intention to bring together eventually all the Cactaceæ which are indigenous to the United States, and already more then one hundred species are represented.

A remarkable landslide occurred a short time ago about twenty miles to the east of Killarney. As a result of the almost incessant rains of the last few weeks, a large portion of bog land slipped from its position, and, taking a southerly direction, swept away everything in its course for a mile or two.

Dr. Andrée now proposes to repeat his attempt of last year to reach the pole by balloon. In place of Dr. Ekholm, Dr. Frankel will accompany him as meteorologist. It is said that two French aeronauts propose making a similar attempt in 1898, according to Science. Their names are Godard and Surcouf.

While investigating the properties of ozone, M. Otto was led to the conclusion that the luminosity produced when ozone and water are in contact is due to the presence in the water of organic matters of animal or vegetable origin. He is also of the opinion that most organic matters are capable of giving rise to the phenomena of phosphorescence, in the presence of ozone.—Comp. Rend.

Swallow wort, or the greater celandine (Chelidonium majus), which Dr. Denisenko asserts is a cure for cancer, has long been used by country people to remove warts. The doctor uses the juice of the plant diluted, both externally and internally, in external cases injecting the fluid hypodermically around the cancerous growth. According to the Lancet, however, experiments with his specific by other observers have not confirmed his results.

The College of Civil Engineering of Cornell University shows how thoroughly alive it is by the announcement of a new hydraulic laboratory of immense size, having a rock-cut canal 500 feet long, 20 feet wide, and 10 feet deep, and a steel standpipe—in which the force exerted by great masses of water is to be studied—which is 6 feet in diameter and 70 feet high. No other hydraulic laboratory of half the magnitude of this one has ever been constructed.

A noteworthy event in the annals of technical education in the United States will be the forthcoming celebration of the twenty-fifth anniversary of the Stevens Institute of Technology, on February 18 and 19. The festivities will consist of a banquet at the Hotel Waldorf, to which representative engineers and technical educators will be invited. On the following day the institute will be thrown open for inspection, and a collection will be shown which illustrates the work of the alumni for the twenty-five years. There will also be a reception tendered to the faculty, graduates and undergraduates, by Mrs. E. A. Stevens, widow of the founder of the institute, at Castle Point, Hoboken. A promenade concert and dance in the evening will conclude the celebration. The institute was founded by the late Edward A. Stevens, of Hoboken, and in 1870 the erection of the building was begun by the trustees. Stevens Institute has always taken a high rank among the institutions for technical education in the United States, and its twenty-five years of successful effort is amply exemplified in the work accomplished by its graduates in all departments of mechanical engineering.

The word anthropo-geography has been coined, says Science, to meet the need of a designation for that branch of geography which treats of the earth in its relation to man. The present rapid advance of climatology has in the same way rendered necessary the coining of a similar word which can be used to designate that aspect of this study which deals with the relations of climate and man. It is natural that the word anthropo-climatology should be chosen for this subdivision of our subject. The length of the term makes it rather clumsy, yet its advantages more than outweigh its disadvantages, and it is to be hoped that it may come into general use. Under anthropo-climatology we should include all the various relations that exist between climate taken in its broadest sense and man. The climatic control of habitability, of occupation, of colonization; the influence of climate in stimulating or controlling migrations, invasions and the like; the immediate and permanent physiological effects of different degrees of temperature, humidity and pressure, etc.; the relation of climates to the distribution and prevalence of diseases; acclimatization, and other related matters may all find shelter in this subject of anthropo-climatology.

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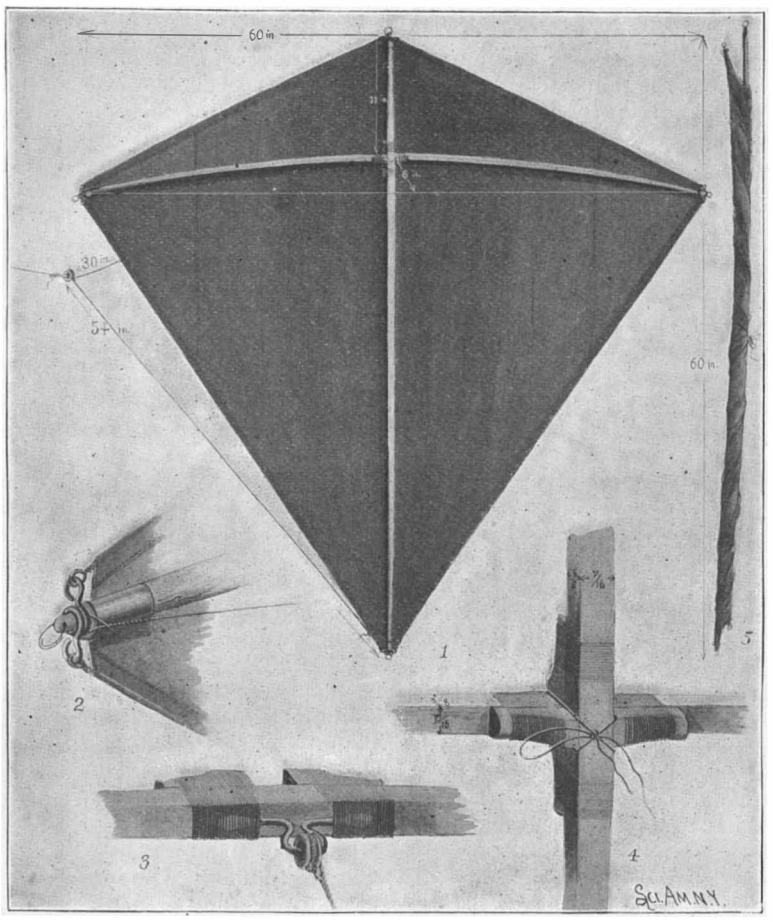
### A FOLDING MALAY KITE.

The kite has long ceased to be the plaything of the boy, and experiments on kite construction and flying are now conducted under the patronage of governments and learned societies. The United States Weather Bureau has considered the subject of kites and auxiliary apparatus for the meteorological exploration of the upper air to be important enough to call for the research of specialists, and the results have been embodied in an interesting monograph. Articles upon the subject have been published in many scientific journals and in the proceedings of learned societies. The number of amateur kite fliers grows larger year by year, and some of their achievements in this direction have been notable. Cameras have been sent up and photographs obtained. Meteorological instruments have been elevated to high altitudes, and even telephone wires have been carried by kites and messages have been transmitted by their aid.

Doubtless many of our readers would like to make the modern kite, either for making observations or simply for pleasure. Dr. Claison S. Wardwell, of 35 West Thirty-eighth Street, New York, has placed at our disposal one of the kites which he has made for his own use. It possesses many ingenious expedients, which might perhaps not occur to the amateur kite maker. It is a tailless "Malay" kite of the Eddy type, constructed so that it folds in small compass and is what is known as the five foot size.

Fig. 1 shows the completed kite with the principal dimensions noted on it. Fig. 2 shows the metal cap which is secured to the end of the stick and also the bent wire terminal which secures the cover. Fig. 3 shows the construction of the joint in the cross stick and the attachments for the bridle. Fig. 4 shows the two sticks joined together with waxed braded fish line, and Fig. 5 shows the kite folded.




DR. WARDWELL'S FOLDING MALAY KITE.

The best material for the sticks is straight grain spruce, as this wood has been found to be less liable to bend under strain or to break at the cross stick. Of course, considerable care should be exercised in cutting out pieces which are free from imperfections. The sticks are $\frac{7}{16}$ inch wide and $\frac{3}{8}$ inch thick and 5 feet long. The sticks can be rounded at the edges and scraped smooth. Blocks are glued on to each stick as shown in Fig. 4. On no account should the wood of the stick be scored or cut away at the joint, as this would impair the strength of the joint. The blocks may be secured to the sticks with good carpenter's glue. They should be accurately fitted, so that the joint is a firm one. After gluing, the joint is tightly wrapped with waxed thread and varnished with shellac. The ends of the sticks are provided with No. 32 or No. 38 blank cartridge shells to which a piece of large sized wire is soldered. This wire is afterward drilled to receive the split ring which holds on the bent wire terminal. The stick is shaped at the end to receive the shell, which is secured to it with hot shellac. The sticks are tied together at their juncture with waxed braided fish line, which may be readily untied.

The bridle eyelet, made of hard rubber, is supported by annealed brass wire (No. 13) hammered thin at the ends and bent into shape, as shown in Fig. 3. This is attached to middle of cross stick with waxed thread and varnished. The cross stick is bent to the proper bow ($\frac{1}{10}$ of its length) and secured with No. 22 spring brass wire, loops having been formed at each end to pass over the ends of the sticks, as shown in Fig. 2. Bend No. 13 spring brass wire into the shape shown in Fig. 2 for the terminals and secure them in place with split rings. Now connect the ends of the sticks with No. 1 picture cord, using great care in the measurements, and allowing the perpendicular stick to bow forward slightly. Now remove the brass bow wire from the cross stick. The kite is now ready for the cover, which may be made from tissue or Manila paper, Chinese silk, or best quality of percaline. With the paper cover the paper is fastened on with good mucilage, leaving the cover flat and smooth. The cover opposite the center of the cross stick and the corners should be reinforced with percaline glued on. Take a few stitches at the corners around the wire. Now place on the bow wire and the cover will be found to have an even and sufficient slack. With a silk or percaline cover, place on the bow wire, and having cut off four pieces of No. 1 picture wire, fasten the two short wires to one bent wire terminal, and the two long wires to another terminal. Place the terminals on the ends of the sticks and draw the wires to the proper position and fasten temporarily. Cut out the cover and baste it on the frame evenly, so that it will lie smooth. Allow about ½ inch hem. Unstring the wire and stitch the cover with a sewing machine, leaving openings at all the corners. String the wire to position again through the hem of the cover and attach permanently to the other terminals while in position on the frame, then reinforce all of the corners. Cut ½ inch hole for the bridle eyelet and its holder, opposite the center of the cross stick, and reinforce the opening with a circle of cloth about 3 inches in diameter. Attach the upper string of the bridle, which is 30 inches in length, to the hard rubber eyelet as shown in Fig. 3. The lower string, which is 54 or 56 inches in length, is attached to the split ring or bent wire terminal as shown in Fig. 1, allowing 8 or 10 inches extra to each string for adjustment.

In placing the cover on the frame, first place the two side terminals on the ends of the cross stick, then place the upper terminal in position. Lastly stretch on the lower terminal by bowing the midrib slightly forward, then fasten all the corners with the split rings. The bridle should be provided at the point where the flying string is attached with a hard rubber eyelet similar to the one shown in Fig. 3. In using a cloth cover, it is not necessary to make as much provision for slack.

The weight of a 5 foot kite with sticks $\frac{7}{16} \times \frac{3}{8}$ inch material constructed in this way is as follows:

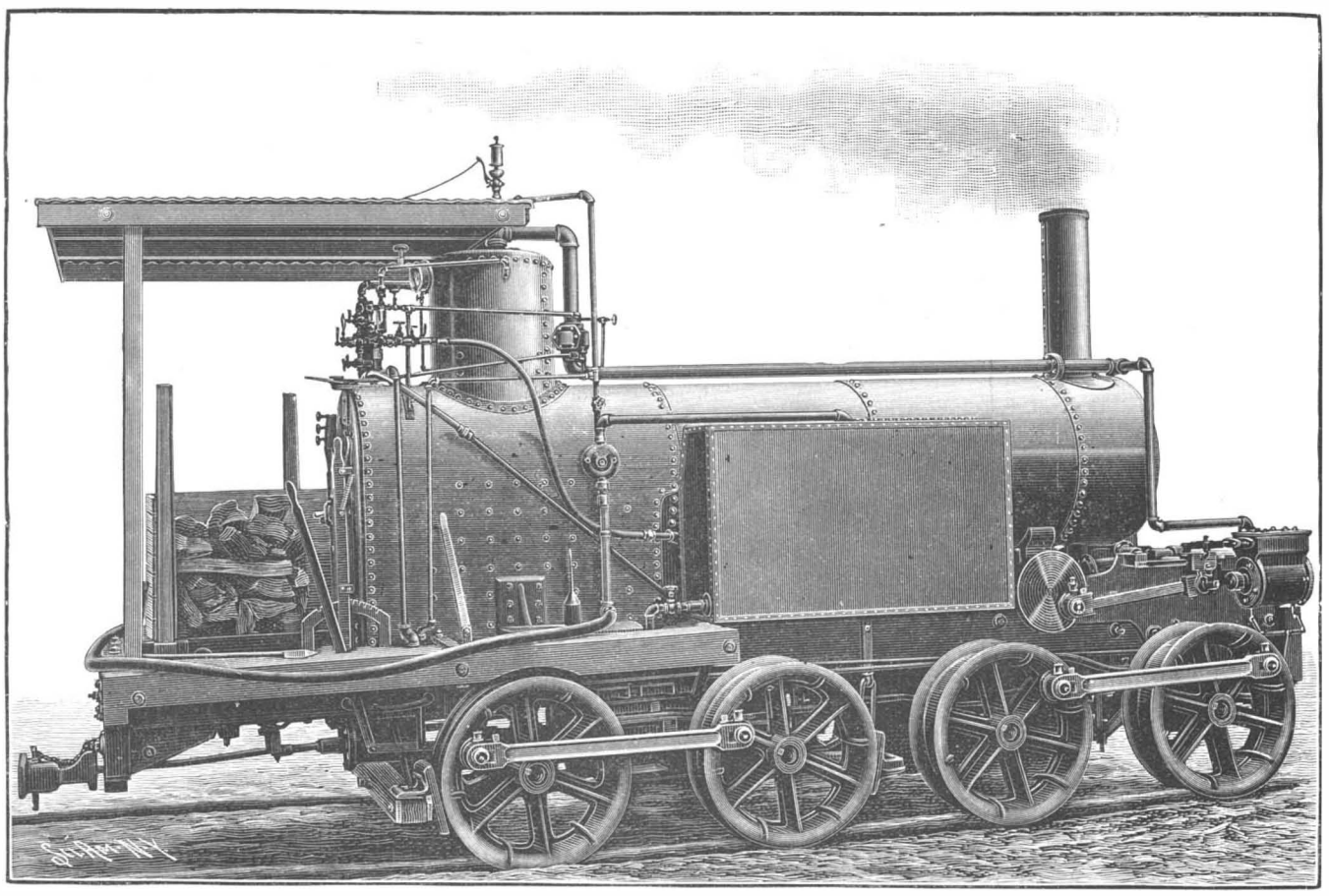
| | |
|---|---|
| Frame | 6 ounces. |
| Percaline cover with wire edges | 4¾ " |
| Chinese silk cover with wire edges | 2½ " |
| Manila paper cover with wire edges | 3½ " |

A 6 foot kite with sticks ½ × ⅜ inch will weigh as follows:

| | |
|---|---|
| Frame | 7½ ounces. |
| Tissue paper cover with cord edges | 1¾ " |

The manner of flying a kite of this description was shown in the SCIENTIFIC AMERICAN for September 15, 1894. It is possible to send up a number of the kites tandem, as shown in the engraving in that issue.

An American flag is excellent to attach to the kite line in light airs and should be in possession of every kite flier. A flag 5 × 8 feet of tissue paper will weigh 4 ounces. A 6 foot pine spar ⅜ inch in diameter will weigh 1½ ounces. A tissue paper flag 10 × 15 feet weighs 13½ ounces. An 11 foot jointed pine spar ½ inch in diameter and tapered weighs 6 ounces. The flag is maintained in position so that its lower edge is horizontal, the spar being perpendicular to the ground by means of three cords which secure the top, middle and bottom of the staff. These cords are secured to the main line by hard rubber eyelets, the main line passing around them, a piece of thin leather preventing chafing. The guy line passes through the eyelet. The upper guy rope is, therefore, short. The middle one, which may be dispensed with in light winds, is longer, and the bottom guy rope is longest of all. At the star end of the flag a hem is made by gluing thin muslin to it. The light spar is run through this hem and tied at intervals with cord. The flag can, of course, be pasted to the spar, but arranging it so that the spar can be withdrawn is preferable.



LOGGING LOCOMOTIVE FOR WOODEN TRACK.

### LOGGING LOCOMOTIVE FOR WOODEN TRACK.

Our publication on August 1 of a cut and description of a logging locomotive, which the designer termed a steam missionary, has brought to our office a photograph of a machine which the builders think is "an improvement on Mr. Stephens' locomotive." It will be seen from the illustration that the locomotive in question is an eight wheeled geared tram engine built especially for logging use. The wheels are 30 inches in diameter, with a double flanged 12 inch face; and they are mounted in sets of four on flexible trucks, so as to allow easy running on very rough roads. All the wheels are used as

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drivers. The engines have cylinders 7 inches in diameter by 10 inches stroke, and by means of cut gearing run a countershaft. From this countershaft the front axle of the rear truck is driven by a heavy steel chain; the back axle of the front truck being driven by chains from the back trucks. The sprocket wheels are double flanged, so as to prevent the chain from running off. All the gearing is made of cast steel. Both the front and rear axles of the locomotive, as will be seen from the engraving, are run by means of side connecting rods. The 40 horse power boiler, which is of a special locomotive type, is fed by a small duplex pump. The locomotive is also provided with a steam siphon for drawing water into the tanks. It has been in use for some months on a rough wooden track, hauling from 30,000 to 40,000 feet of logs per day.

The total cost of building the wooden track is from $300 to $400 per mile, according to the class of country on which it runs. Where the ground is rather swampy, it requires several small bridges, but on ordinary level ground the cost does not exceed $300. This machine is so geared as to take ordinary loads at from four to six miles per hour, and if first-class track is furnished, the speed will be considerably greater.

The Curtis Manufacturing Company, of St. Louis, who are the builders, state that this engine, which is run by two men, is doing work which formerly required thirty yoke of oxen and five men.

### Mosquitoes and Malaria.

Recent researches show that it is very probable that malaria may be propagated by mosquitoes. Dr. Amigo Bignani brings forward some proofs in support of this theory. His article is translated into English and published in the Lancet, from which we take the following:

"If one admits the inoculation hypothesis, many facts which are difficult to explain by the theory of air conduction would find a simple and satisfactory explanation, and it is easy to demonstrate this. First of all, the fact, which we have already discussed at length, that malaria is not carried by the winds, would be easily understood, knowing as we do how closely these diptera are bound to the soil on which they are hatched, and how adverse they are to allow themselves to be carried away, hiding, when the wind blows, in the ground, among the grass, or under the trees. Also when a sea breeze blows in the afternoon the mosquitoes of the Roman Campagna do not show themselves, and only when the wind has gone down at the setting of the sun do they rise in clouds everywhere and attack animals and men. That the evening and night hours are the most dangerous, on account of the facility with which fever is then taken, would be easily understood by any one who knows the habits of this nocturnal dipter. That malaria only rises to a moderate height would also be equally intelligible, because the inoculating insect always flies near the ground. A satisfactory explanation would also be furnished of the great danger of sleeping in malarial districts, a fact of which the supporters of the air conduction theory have never been able to give more than an artificial explanation. Any one who has experience of malarious districts well knows a number of cases in which the patient attributes the fever that torments him solely to having slept a few hours in a place where several times he had perhaps remained while awake without harm. Three years ago I made with my colleague, Dionisi, various excursions into malarious localities for the purpose of study, and more especially with the object of collecting from the inhabitants the results of their experience—an experience which one finds with difficulty in books. Many precautions which they take against the fever are taken, one would say, to defend them from the sting of insects. They avoid going out at night; they are very careful not to sleep in the open air; they hermetically close the windows—windows with badly fitting shutters, which might impede the ingress of insects, but certainly not of air and of the germs which it might contain. They take great care of their mosquito curtain, making it of very close net, under which they sleep, thoroughly shut in, notwithstanding the great heat.

"It is interesting to remember that Emin Pasha never omitted to take a mosquito net with him on his African journeys, and he attributed to this precaution his not having had fever, the malarial agent in his idea being a corpuscular substance of which he supposed the close net did not permit the passage. Nicolas, in his book on the 'Hygiene of Camps in Marshy Places,' thus expresses himself on this question: 'And the mosquito net, well shut, is indispensable at night. Without attributing to the puncture of mosquitoes any relation whatever with the microbes of the fever, one may be certain that irritation by them produces sleeplessness and predisposes to the fever.' On the estates and farms visited by us in the Campagna, the overseers, who are less frequently attacked by the fever than the workmen, protect themselves with great care from the bites of insects, especially during sleep. On the estate of Porto, near Fiumicino, where a bad type of malaria prevails, and which I visited several times in company with my colleague Dionisi in the height of summer, we obtained the greatest amount of information about the habits of mosquitoes, and the results of the experience of the inhabitants on the way in which the fever is caught. The greater number think that the fever is taken almost always during sleep. A very brief stay sometimes suffices—even one night. But ordinarily, even in districts very subject to malaria, a longer stay is necessary, so that the workmen who go on to the property at the beginning of July for the thrashing commence to get ill as a rule eight or ten days after their arrival. On the other hand, those who go in September for the working of the ground often get ill more quickly—after only two or three days' stay. Many have observed that in autumn, after the rains, the mosquitoes increase and likewise the fevers, and as the season advances they disappear together little by little. Thus, collecting from the inhabitants (who are really much better informed about malaria than some medical men) the results of their experience, the conviction grows upon one that if malaria were inoculated by mosquitoes into man, all the questions which I have put in a preceding paragraph would receive an adequate answer. Malaria behaves itself with regard to man as if the malarial germs were inoculated by mosquitoes."

### Exportation of American Machinery.

The machinery export movement in the United States seems to be attaining some prominence. There is no doubt that the American manufacturers of labor-saving machinery and implements are devoting more attention to the possibility of building up and extending an export business with foreign countries than they have done for many years. The time appears to them to be very propitious. The past year or so has seen a large augmentation in the demand from abroad for certain types and classes of machine tools and other manufactured products which have been for some time an American specialty. But the fact must not be left out of mind that the export of such specialties creates a demand in the place of their sale which, in that event, is gradually satisfied on the spot. With a protective barrier hampering her industries, America can never compete on a large scale with the exports of a free trade country.—Industries and Iron.

## RECENTLY PATENTED INVENTIONS.

### Engineering.

GAS OR OIL ENGINE.—Eugene Fessard, Poissy, France. In this engine the cylinder has a spring-controlled valve periodically actuated by a rod driven from the engine, a click or pawl holding the valve open independently of the movement of the rod, and a governor controlling the position of the pawl according to the speed of the engine. The engine may be worked by petroleum or by gas, in the latter case the breech of the cylinders being provided with chimney and incandescent tubes or an electric arc. The engine is of simple construction, and may be worked in either vertical, horizontal or oblique position, being light and its parts readily accessible, adapting it for a wide variety of uses.

### Railway Appliances.

CAR FENDER.—Joseph R. and Joseph A. Jacques, St. Paul, Minn. This fender is made in the form of a segment of a circle, and has a strong frame covered with stretched netting, the side bars of the frame having wheels adapted to travel on the track rails. The curved side bars of the frame have each at the back a hook, adapted to be hooked and secured by set screws in arms adjustably held on a transverse shaft journaled in bearings at the front of the car platform. To this shaft is also secured a rearwardly extending rod bearing a weight to almost counterbalance the weight of the fender, and insure an easy running of its wheels on the track rails. Extending upward from this rod is a bar carrying a foot piece, by pressing on which the motorman may swing up the front end of the fender to a limited extent, to move its wheels from the track rails, as may be desired at crossings, etc.

CAR COUPLING.—David M. Lipps, Harrodsburg, Ky. A coupling of the hook and catch type is provided by this inventor, adapted to couple automatically with an approaching car equipped with a like coupling, and of such construction that cars thus coupled may be readily uncoupled by a trainman from the roof or the side of the car. The drawhead has a chamber in whose lower wall is an apertured incline, in which rocks a shaft carrying two tripping dogs, there being at the side a detent spring adapted to contact with a block on the shaft and hold it to elevate a hook bar pivoted in the drawhead until a hook bar on another coupling enters the drawhead. The device may also be coupled by the ordinary pin and link.

SWITCH.—Edward Q. Norton, Daphne, Ala. An easily operated apparatus is provided by this invention whereby a train on the main line may positively operate the switch points to insure an open main line, whether the train be moving in one direction or the other. An operating rod or bar extending alongside the switch point, and movable toward and from it, has a portion to engage the switch and a portion for engagement by the flange of a locomotive drive wheel or a projecting tripping rod, the operating rod having a spiral surface whereby it is turned gradually and easily, avoiding jars or shocks.

### Electrical.

TROLLEY.—Wilbur L. Pepper, Philadelphia, Pa. A twin or dual pole is provided by this invention, to more efficiently support a trolley wheel, which may be made longer than those in common use. The two parts of the pole are made in pivoted sections, the upper sections being pivoted to the trolley wheel by means of yokes and trunnions, and the lower sections pivotally attached to a support on the car, and also connected by a link with a spring-controlled lever, adapted to hold up the sections and press the wheel against the trolley wire. A cord extends from near the upper end of one of the lower sections, to be within convenient reach of the motorman.

### Mechanical.

PAPER PULP STRAINER.—John W. Smith, Sandy Hill, N. Y. To strain or screen the pulp, according to this improvement, two independent screening sections are provided, one of which may be placed out of action without affecting the operation of the other. Two screen boxes are provided, with screen plates and diaphragms, and arranged end to end, each being composed of two sections and having the adjacent ends of their lower sections formed by removable cross bars, each box having means for closing the end of its upper section adjacent to the other box, whereby when one box is open the other may be in operation.

LATH FEEDER FOR PAPER DRIERS.—William H. Waldron, New Brunswick, N. J. This is an improvement on a formerly patented invention of the same inventor, the feeder being arranged to insure a positive delivery of a single lath at a time from the feed chute to the carrier chains. Combined with the delivery chute is an oscillating carrier chain adapted to receive the lath, a segmental carrier being mounted to oscillate and formed with a radial slot or notch, to hold the lath normally in place in the delivery chute. The carrier has lath-receiving slots equal in size to the chute outlet, and movable to and from the latter as the carrier is moved on its axis.

CRUSHING APPARATUS.—Ignacio M. de Oca y Melian, New York City. To crush ores and pound similar material, according to this improvement, a cam-carrying shaft is mounted in a frame, the cams engaging levers fulcrumed on the frame and connected with two vertically movable stamps, each of which carries a mortar. A cord connected with each lever is adapted to hold it out of engagement with the cam, to suspend the operation of either stamp as may be desired.

### Agricultural.

REAPER AND MOWER CUTTER BAR.—Moses Jarvis, Leota, Miss. According to this improvement, the knives may be conveniently and quickly taken from or replaced in the cutter bar without removing the latter from the machine, and each knife is provided with independent locking devices. The cutter bar has knife seats with undercut end walls, beyond which extend buttons pivoted on the cutter bar, the knives having shanks shaped to enter the seats, and the shanks having recesses to receive the ends of the buttons extending within the seats, the buttons thus forming latches to lock the knives upon the bar.

### Miscellaneous.

PHOTOGRAPHIC SHUTTER.—Daniel P. O'Leary and Samuel B. Kull, New York City. Two shutter plates or slides, according to this invention, are arranged to secure the lens, and have apertures normally out of coincidence, one of the plates being adapted for movement independent of the other to bring the apertures in line for the passage of light through the lens. A catch holds the other plate or slide with its aperture in line with the lens, and there are means to disengage the catch by the return movement of the first plate, so that the plate held is released.

MUSIC LEAF TURNER.—Thomas A. Farrell, Chicago, Ill. This is a simple and inexpensive device, the body of which comprises a rack adapted to rest on a music stand, or the rack ordinarily used on pianos and similar instruments, there being journaled in the rack a turning shaft to which is pivoted an angular turning arm and there being also a spring-controlled holding arm having rocking movement on the rack and connected with the turning shaft. With this improvement the leaves may be turned with great facility and without danger of tearing.

LOCK.—Patrick J. Leonard and William Head, New York City. A lock especially adapted for use on milk cans has been devised by these inventors, the lock comprising two parts, one adapted to be inserted in the other and provided with tongues. A bolt having a conical thread screws in the inner part of the lock and expands the tongues against the inside of the outer part of the lock to hold the parts against separation. The can has an outwardly extended lip on the neck of the body portion, a tubular lock section being expanded in an opening in the neck and a hollow section attached to the cover being adapted to enter the tubular section. The lock may also be advantageously employed for various other purposes.

SKIRT SUPPORTER.—George Kierski, New York City. To support a comparatively heavy skirt without attaching it to the waist band, this inventor has designed a supporter consisting of a single strip of resilient metal bent to form two clasp and side members, one of the members having an opening at its free end, while the other member may be pressed apart by the thumb and finger and made to readily engage a portion of the dress material, the body of the device being adapted to readily slide along a belt, by which the device and skirt are held up.

CURTAIN SUPPORT.—De Kalb Turbeville, Roanoke, Ala. A one piece bracket, which may be readily put up and taken down, according to this invention, has end arms for the shade roller and seats for the curtain pole, the cornice having catches engaging on the arms. The construction permits the convenient removal and ready replacing of the curtain and pole, and in case the shades are too wide for the windows, the bracket may be conveniently put up to project beyond the casing.

ARTIFICIAL LIMB.—John Neyquist, Coburn, Pa. This invention relates particularly to artificial limbs for amputations below the knee, and provides for connecting the leg irons with the foot by a peculiar joint, the ankle portions being formed of a metal cylinder riveted to the leg irons, a wooden filling being secured in the cylinder, and elastic blocks socketed in the filling and the foot on front and rear sides of the joint.

THERMOCAUTER.—Friedrich Drumm, New York City. According to this improvement, gas from the generator is utilized for externally heating the cauterizing tool when starting the apparatus and for supplying the internal burner of the tool with the gas necessary to keep it at the desired temperature during the operation. An attenuated tube forms the terminal of the supply pipe and extends into the hollow of the point, a return pipe provided with perforations and connected with the hollow of the point surrounding the supply pipe, while a casing secured to the burner has a rear open end. An auxiliary burner for heating the point is arranged to be swung into and out of operative position.

DENTAL TOOL.—Flavel A. Rudolph, Carmi, Ill. This is a tool more especially designed for use in a dental lathe, to dress down rubber or metal plates, the invention covering a particular construction of expansible rubber head and details of the expanding mechanism. On a shaft is held a clamp of two sections which may be moved relatively to each other, there being held between the sections a head of rubber or other expansible material, and the head having a concave periphery which becomes cylindrical when the head is expanded. During the expansion of the rubber head its marginal portion is also forced around the edges of the clamp sections.

SPECTACLE CASE.—James H. Caruss, Stamford, Conn. In this case keepers or guards are made to project inward from opposite sides, to extend over the spectacle frame and to hold the spectacles in position in the body of the case, permitting of opening and closing the hinged cover without interfering with any part of the spectacle frame. The keepers hold the spectacles without injuring or bending the frame, and there is no danger of their dropping out accidentally when the case is opened.

CLARIFYING SACCHARINE SOLUTIONS.—Leon F. Haubtman, New Orleans, La. This inventor has heretofore obtained several patents on evaporating apparatus, of which this forms in a measure a continuation, the invention affording means by which saccharine solutions may be rapidly clarified without contact with atmospheric air. A series of connected heating vessels is employed through which the solution to be clarified is forced in one direction while the heating medium, as steam, is forced into the vessels in the opposite direction, there being also vessels in which the temperature of the hot solutions is reduced by a cold solution flowing through the vessels in its course to the clarifying vessels.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

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## Business and Personal.

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## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

**Buyers** wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(7089) C. A. M. asks: 1. Is there a SUPPLEMENT that gives information on cassava, its cultivation, uses, preparing of the starch, etc.? A. In SUPPLEMENT, No. 915, you will find an article on some products of cassava. 2. Can you give a reliable formula for preparing an ink that writes blue at first, then changes to a permanent black? A. We refer you to articles on the manufacture of inks in SUPPLEMENT, Nos. 157 and 1073. 3. How can the coloring matter of annatto be taken from the seeds without the use of oils? A. Annatto is obtained from the reddish pulp surrounding the seeds in the fruit of Bixa orellana. The pulp is separated by bruising the fruit, mixing it with water, then straining through a sieve and allowing the liquid to stand till the undissolved portion subsides. The water is then poured off and the mass which remains, having been sufficiently dried, is formed into flat cakes or rolls and sent to market. 4. Please give an easy method for preparing the essential oil of orange and lemon peels. A. SUPPLEMENT, No. 887, has an article giving information on the manufacture of essence of lemon, also orange, and many other formulas. 5. Is banana fiber of much value? How ought it to be prepared for the market? A. Brief mention of banana fiber is made in SUPPLEMENT, No. 1043. We think you would find the articles in SUPPLEMENT, Nos. 1040 to 1046, on "Commercial Fibers" valuable. 6. When not otherwise stated, must I take for granted that ounces and pounds, etc., in formulas of the "Scientific American Encyclopedia" apply to avoirdupois weight, and should liquids be weighed as well as solids? A. Avoirdupois weight is generally understood; the liquid should be measured. Where parts are mentioned, the formula should be made up, using parts by weight, whether of solid or liquid.

(7090) W. A. M. asks (1) if malleable cast iron will serve to good advantage as field cores and pole pieces in a dynamo electric machine. Can you tell me how the permeability compares with soft steel, good cast iron and wrought iron? What I am desirous of learning is as to which is best and most easily excited in the case of an electromagnet? A. The general rule is that soft iron has the highest permeability, but no exact figures can be given, as each quality will vary from others even of the same kind. In dynamos which are self-exciting it is important to have some residual magnetism on which to build up the charge. The use of a soft iron field magnet core, and still more of a laminated core, militates against this. Partly for this reason cast iron is recommended for dynamo field cores. 2. Is a small size magnet wire used in the field of an incandescent machine, of say 100 lights, to get pressure and larger wire for amperes. In other words, will a small wire of a large number of turns give me pressure, where a larger wire of few turns would give quantity? A. Your conception is right, volts depending on number of lines of force cut in a given time; this number is increased by using finer wire of the armature, and the higher pressure has to be compensated by smaller wire; i. e., higher resistance on the field.

(7091) E. H. S. asks: Will you please give me receipt for tanning buck skin or preparing it like chamois leather or leather in gloves? A. Take a skin, either green or well soaked, and flesh it with a dull knife; spread the skin on a smooth log and grain it by scraping with a sharp instrument; rub nearly dry over the oval end of a board held upright. Take the brains of a deer or a calf, dry by the fire gently, put them into a cloth and boil until soft, cool off the liquid until blood warm, with water sufficient to soak the skin in, and soak until quite soft and pliable, and then wring out as dry as possible; wash in strong soapsuds and rub dry and smoke well with wood smoke. Instead of brains, oil or lard may be used, and the skin soaked therein six hours. This is called Indian tan.

### NEW BOOKS AND PUBLICATIONS.

THE OPTICIAN'S MANUAL. By C. H. Brown, M.D. Philadelphia: The Keystone. Pp. 376. Price $3.

A treatise on the science and practice of optics is here put forth by a professor of optics and refraction, and former physician in the Philadelphia Hospital. It is a republication of essays heretofore published serially, and which have commanded wide attention. It treats of the eye anatomically and optically, of the simpler laws of optics, and of lenses, as adapted to the different needs of the eye under all conditions. It is a practical, up to date book, for opticians and those who make a specialty of diseases of the eye.

**The Columbia Calendar, of the Pope** Manufacturing Company, reaches its twelfth annual issue in the edition for 1897, and, besides being a desk convenience to many thousands of users, is designed to teach in its small texts and illustrations the joys of outdoor life and the blessings and economy of good roads.

**The Victor Calendar, of the Overman** Wheel Company, is also a desk memorandum pad, and a repository of a choice selection of short quotations from a wide range of authors, as well as jokes and scraps of useful information.

**The Walworth Manufacturing Com**pany of Boston, manufacturers of brass and iron goods and tools, and steam, water, and gas work, also publish a convenient desk calendar.

### TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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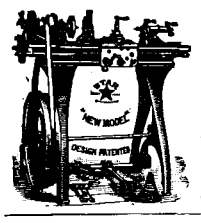

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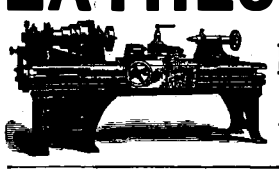

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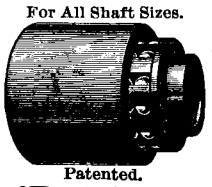

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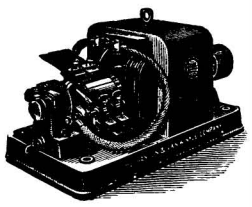

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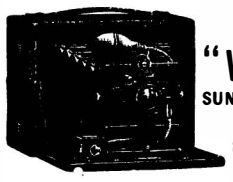

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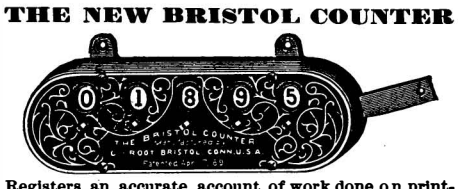


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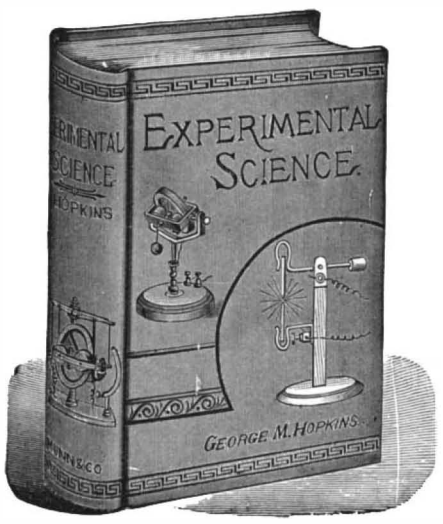


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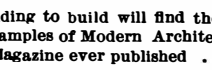

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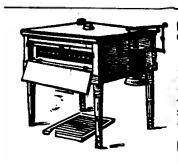

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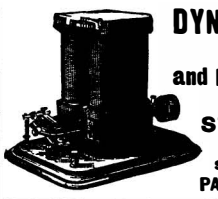

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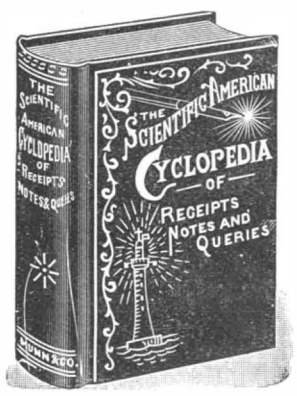


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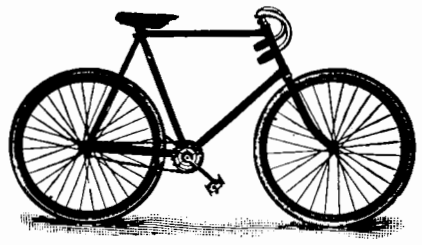

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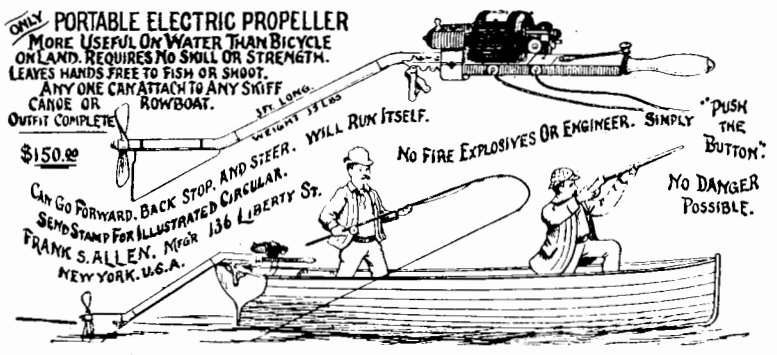
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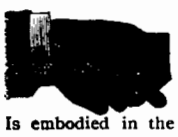

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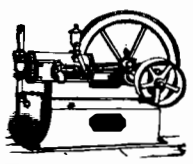

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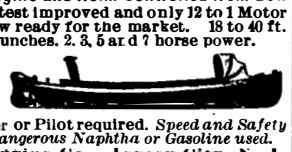

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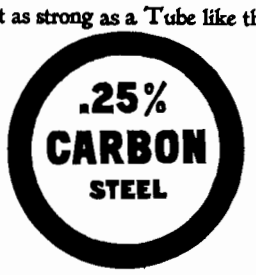


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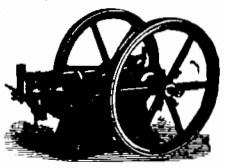

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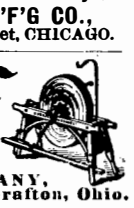

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**PRINTING INKS**

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

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